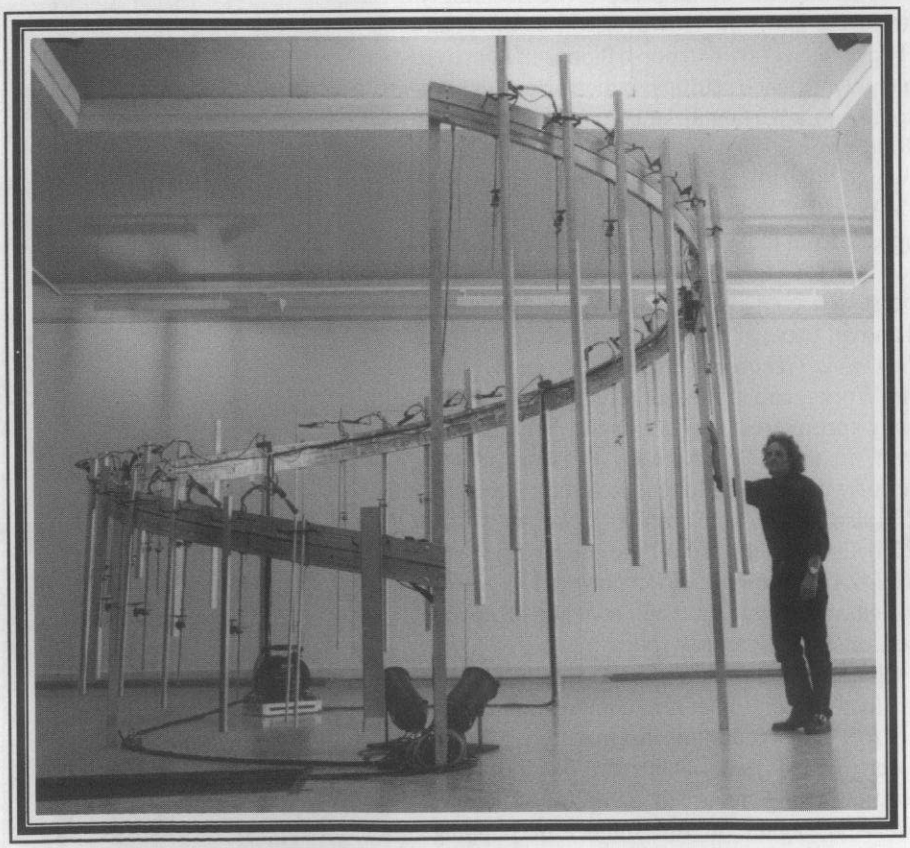
VOLUME 14 #2 DECEMBER 1998 PRICE $6

EXPERIMENTAL MUSICAL INSTRUMENTS

For the Design, Construction, and Enjoyment of Unusual Sound Sources

HYPERBIWA, HYBRID ZURNA

The Japanese biwa is an instrument of another time, steeped in tradition. Yet in recent years some players have been composing anew for it. Jhon Miura Hardy, in this issue of *Experimental Musical Instruments*, describes the forms the biwa has taken through its thousand-year history, and then goes on to describe something entirely of today: an altered biwa of his own uncanonical design called the *hyperbiwa*.

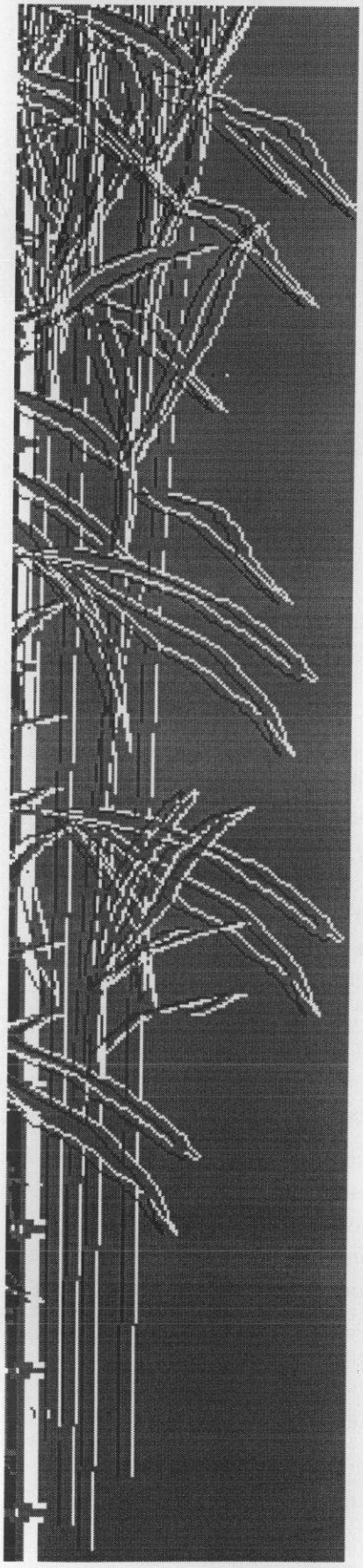


Above: The Aluphon, by Werrner Raditschnig. See his description of the instrument on page 7.

We have more transformations in this issue, too. The Middle Eastern zurna, in the hands Linsey Pollock, evolves into the *hybrid zurna*, even as a Macedonian bagpipe reincarnates as the *rubber-glove gaida*. A 500-gallon steel tank, through the efforts of author Reed Maxon, becomes ... a 500-gallon steel tank! — but one with impressive possibilities in sound.

Also in this issue, Martin Riches describes the MotorMouth, his latest development in acoustic human-voice synthesis. Robert Moore presents his flute-clock, a small, hand-made, self-playing barrel organ. Reed Ghazala explains how to gain control of an alien-talking micro-chip.

And, as always in *EMI*, there's much more. So open, and read.

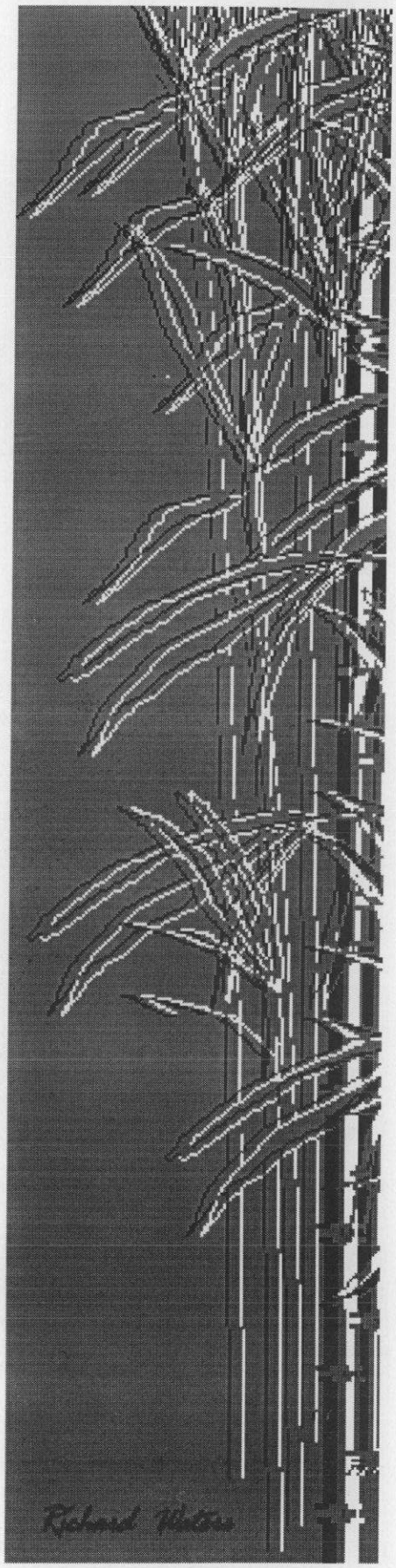


I HAVE BEEN PLAYING BALLOONS for the past eight years and have performed extensively in the U.S. at such places as Lincoln Center Out-of-Doors, Roulette, Performance Space 122, and The Knitting Factory, and throughout Europe. I have appeared as a balloon musician in compositions by John Zorn and Roscoe Mitchell, and in improvisational performances with Juilliard's Flux String Quartet, Joe Gallant's "Illuminati" big band, Jane Scarpantoni, Ken Butler, Andrea Parkins, and many others. My new CD *Balloon Music* was recently released on the CRI label. [For a review of this CD see *EMI* Vol. 14 #1, Sept 1998 — ed.]

The recent article "Scratching the Surface: The Balloon In My Life" by Ricardo Arias was very thorough in its description of balloon playing techniques. I also enjoyed the "World of Balloon Music" selected bibliography at the end. Mr. Arias and I spoke by phone soon after he had completed the article and submitted it to *EMI*. Regretfully, he knew little about my work when he wrote the article.

Mr. Arias incorrectly states in a footnote that I end my pieces by popping the balloons. In fact, I have written over fourteen compositions for balloons and I do not use popping in any of them. I find popping to be rather limited, and the number of sounds achieved from rubbing inflated balloons or manipulating the mouthpiece to be seemingly infinite in comparison. However, on a few occasions I have been known to pop balloons in improvisational performance settings, either by accident or in response to a particular situation that calls for a very loud noise.

I would like to add some information to Mr. Arias' "World of Balloon Music." Marion DeLaet, a composer from the Netherlands, wrote a beautiful composition for eight balloons entitled *Air*, which was presented on Dutch television and radio. As stated above, I appear as a balloon musician in John Zorn's *Cobra* (recording available from Knitting Factory Works) and in Roscoe Mitchell's *Third Eye Soliloquy* (premiered last fall at the Isthmus Jazz Festival). In the 1970s Anthony Braxton wrote a number of works for balloons, including *Composition 25* (also known as *Creative Orchestra Music*) for 225 balloons, released on the Moers label, and *B-X NOI47A*, featuring balloon players Leo Smith, Leroy Jenkins, Steve McCall and Mr. Braxton, released on BYG Records. New York City composer Charles Wood mentioned to me that he has used balloons as instruments in compositions he has written for his percussion ensemble. A Swedish composer named Palle Dahlstadt has written a composition using recorded samples of balloon sounds. And, again on the subject of popping, P.D.Q. Bach (aka Peter Schickele) includes a balloon pop and some other balloon sounds in his ballet



score *The Preachers of Crimetheus* (recording available on the Telarc label).

Additionally, a large number of avant-garde instrumentalists have used balloons in combination with their main instrument, either attaching it or playing it separately as part of their "kit." These include guitarist Eugene Chadbourne, vocalist/percussionist David Moss, drummer Terry Dey, saxophonist Dirk Marwedel, and tuba player Leo Bachmann.

I have also heard rumors concerning a clown in France who was supposedly a balloon virtuoso. If anyone knows about him, please write *EMI*!

I hope to eventually set up a website devoted to balloon music, and I will let *EMI* know when that happens. Thanks to Ricardo Arias and *EMI* for their extensive research on this topic.

— Judy Dunaway

I RECENTLY DISCOVERED AN INTERESTING BOOK that is surely worth being publicized in *EMI*. It is written in German and has 211 pages with b/w drawings and photos.

Title: *Aeolsharfen; der Wind als Musikant*. (Aeolian harps, the wind as musician) (211 pages). Authors: Mins Minssen, G.Krieger; E.Baeuerle; A.Pilipczuk; J.Hagen. Editor: Verlag Erwin Bochinsky Gmbh & Co. KG; Frankfurt am Main; 1997. ISBN: 3-923639-14-7

The authors:

M. Minssen works at the University at Kiel in esthetic experiences through natural phenomena.
G. Krieger was a lecturer at the University Bielefeld
E. Baeuerle, physicist (IESGO Institution)
A. Pilipczuk, a researcher in historic musical instruments
J.Hagen, master violin maker.

The first chapter of the book begins with the aeolian harp's change from a legend to a real instrument. A description of methods ranging from restoration of old instruments to new construction with new materials (brass, aluminium) and changes in the wind-funnel is followed by descriptions of the experiments of the Italian priest Gattoni in 1785. Mr. Gattoni performed some experiments with his "meteorologic harmonica" or "giant harp," with iron wires 100m long, in order to predict the weather.

The second chapter reflects the strange intermediate position between instrument and automatic machine. The next section gives detailed plans and advice for building aeolian harps.

In the third chapter the author tries to describe some of the acoustic phenomena with physical theories of waves and currents. There are a lot of actually unsolved, i.e. not understood, aspects of aeolian tones. The chapter ends with an overview of the state of natural scientific/mathematical researches concerning "whirl detachments" (I don't know the exact terminology!) and their relevance for a better understanding of the aeolian harp tones.

The fourth chapter is dedicated to the history with a peculiar look at the aeolian harp manufacturer Melhop, who lived 1802-1868 in Hamburg.

Bamboo graphics on facing page and page 10 by Richard Waters.
See his bamboo article starting on page 33.

IN THIS ISSUE

EXPERIMENTAL MUSICAL INSTRUMENTS
For the Design, Construction and Enjoyment of Unusual Musical Sound Sources

ISSN 0883-0754. Printed in the United States

EDITOR: Bart Hopkin OFFICE MANAGER: Karen Jaenke

PROOFREADER: Janet Hopkin

EDITORIAL BOARD: Donald Hall, Roger Hoffmann, Jon Scoville, Robin Goodfellow

Published in March, June, September and December by Experimental Musical Instruments, P.O. Box 784, Nicasio, CA 94946. Phone / fax (415) 662-2182.
E-mail EMI@windworld.com Web Site http://www.windworld.com/emi

Subscriptions US$24/year ($27 in Mexico and Canada; $34 overseas). Back issues & cassettes available; write for prices or see ads in this issue.

ADVERTISING POLICY: Experimental Musical Instruments will run ads which are potentially interesting or valuable to the readership. Please write for advertising rates. Subscribers can place "classified" ads of up to 40 words without charge.

SUBMISSIONS: Experimental Musical Instruments welcomes submissions of articles relating to new or unusual musical instruments. A query letter or phone call is suggested before sending articles.

A report on the manufacturing and sound of modern aeolian harp is the content of the fifth chapter, which ends the book.

Because good literature about aeolian harps is a very rare thing, I was very pleased to find and read this book with a lot of valuable thoughts and suggestions. Think it is worth being mentioned in *EMI* for all "aeolists".

— Uli Wahl

I WAS PLEASED to read Peter Whitehead's letter. [Peter's letter in *EMI* Vol. 14 #1, Sept. 1998, discussed the use of electric pickups on simple homemades or found objects. Peter suggests that, while this may give rise to intriguing sounds, it doesn't really constitute the creation or invention of a new instrument, since the pickup, usually store-bought and ready-made, is itself responsible for the sound as much as the thing it's attached to. — ed.] I do agree with him, but it also addresses a pretty complex can of worms. Doesn't it infer that every c-class rock band using an amplification system through a mixing desk is *really* playing live "electronic music"? If one can play "Clementine" on it, is it *really* an experimental instrument? Is it *really* an instrument if one *can't* play Clementine on it? Is all that percussion and cross-cultural stuff really just sound effects? Is a device that only plays its own music really an instrument (this includes 95% of my stuff)? Is *recorded* music really "classical music"? Actually, all this takes us back to my piece *The Way I See It* on cassette which was reviewed in *EMI* in the mid-80s (Vol. 2 #6, April '87) where I question the active/passive states of the listener and their rights/potential, etc.

But back to Whitehead's letter — Take away the pickups, etc. and you're left with an instrument that's quiet, but an instrument nonetheless. So the pickup thing could be an attempt to "do it for many" rather than just for one or two. This, I feel, is a societal issue rather than a musical one.

— *Ernie Althoff*

I JUST DISCOVERED your web site and was really surprised that I have never heard of your publication. I am a ragtime researcher and as a result have had an ongoing interest in mechanical as well as live, recorded and sheet music.

I happen to own an original Deagan Una-Fon which I am in the process of restoring. However, having some guidance from someone who is knowledgeable about this instrument would be greatly helpful. I also understand they are rather rare, so this may be a tall order.

Would it be possible for your organization to help me find others who may own a Una-Fon? I would greatly appreciate any leads. Thanks in advance.

— *Richard Zimmerman*
dicktracy@oro.net

From the editor: The Deagan Company manufactured the Una-Fon in the 1930s. Although Deagan is better known for acoustic instruments, the Una-Fon was an electric organ, with volume-capacity and timbral qualities intended to be suitable for outdoor performance. Readers with knowledge of the instrument are encouraged to contact Richard Zimmerman at the email address above.

WEB SITES OF INTEREST

Here's this issue's listing of web sites relating to unusual musical instruments. In addition to these, many more are listed in previous issues of *EMI*. Also, we've finally gotten around to updating the links page in *EMI*'s own website (http://www.windworld.com/emi), so you can look there for a more extensive listing. *And* see also Glenn Engstrand's "Site Check" on the following page.

Center for the Study of Free Reeds:
http://www.gsuc.cuny.edu/freereed/

Patrick Ozzard Low's study of future possibilities for instruments to play in alternative scale systems:
http://www.c21-orch-instrs.demon.co.uk

Terra Nova — musical group using experimental instruments from a variety of different makers: http://spacebeat.com

Johannes Bergmark's instruments, plus writings on surrealism and other Bergmarkian topics: http://www.flashback.net/~bergmark/

Peter Whitehead's instruments & music: http://www.healthyarts.com

Mid-East Manufacturing, Inc — lots and lots of instruments from around the world for sale, with pictures of most of them:
www.mid-east.com

Sympathetic Vibratory Physics, a unified theory of matter and motion developed by the 19th-century physicist John Keely (and not likely to be credited by modern scientists), presented here by Dale Pond, along with elements of Pond's anti-government philosophy: http://www.svpvirl.com/index.html

Jacob Duringer's Monolith (two-dimensional array keyboard):
http://www.electronic-mall/heavenbound

Eric Leonardson's electroacoustic instruments and related works:
http://www.tezcat.com/~eleon/

Graham Leak's diverse and inventive instruments:
http://www.farben.latrobe.edu.au/mikropol/volume2/leak-g/lea k-exhibit.html

Kraig Grady's instruments, scale systems and general culture of Anaphoria Island: http://www.anaphoria.com

Automated instruments by Frank Pahl:
http://www.lmstudio.com/area2.html

A Dutch newsletter devoted to Jew's harp (with text in English as well): http://www.zeelandnet.nl/paclax/jewsharp

Reed Ghazala — reviews of some of his works:
http://207.137.50.71/reviews

Musica Bambusa — bamboo instruments from this Australian company: http://www.shoal.net.au/~musicabam/

Ángel Sampedro Del Río's bamboo wind instruments:
http://www.earthcare.com.au/argentina/argentina.htm

Dan Senn, sound sculptor — new web address:
http://www.newsense-intermedium.com

Musical saw and theremin:
http://www.cyberramp.net/~sawman/home.htm

Wild Sanctuary, nature sound recordists:
http://www.wildsanctuary.com/frameset.html

Luc Lockwell's contemporary incarnation of the ancient rebec:
http://dsuper.net/~lockwell

A Swanee slide saxophone (wonderful, mostly forgotten 20th century instrument) on sale by auction at
http://cgi.ebay.com/aw-cgi/ebayisapi.dll?viewitem&item=27369 301

Tommy Dog: Wide-ranging site. A new feature (not yet fully developed) is a listing of instrument makers with product descriptions, prices and contacts: http://www.tommydog.com

NOTES FROM HERE AND THERE

A 21st-CENTURY PROPOSAL: Patrick Ozzard-Low, working through Alternative Tuning Projects in association with London Guildhall University, has written a study entitled *21st Century Orchestral Instruments: Acoustic instruments for alternative tuning systems*. The paper is intended to serve as part of a pilot feasibility study for a proposal to establish a center, or research and performance institute, devoted to new acoustic instruments and particularly orchestral instruments for alternative tuning systems. But if you sit down to read the 150-plus page document, you'll find that it's not just a plan for setting up the proposed institute. Ozzard-Low has put together a substantial and insightful overview of current trends in tuning theory and the application of alternative tuning to acoustic instruments. You can view the document at http://www.c21-orch-instrs.demon.co.uk, or contact Patrick Ozzard-Low through Alternative Tuning Projects, 97 Onley St., Norwich, Norfolk, NR2 2EA, UK.

A CENTER FOR THE STUDY OF FREE-REED INSTRUMENTS has newly been established at City University of New York. The center is devoted to fostering scholarly research on all aspects of all free-reed instruments. This will include everything from the

SITE CHECK

This is the second in a series on web sites of interest to experimental musical instrument inventors. The last article explored communities on the web. The next article will review the various lists out there and how to use them. This article features those web pages in which you can get instruction on how to build your own experimental musical instruments. I am not listing my own site (which features woodwind instrument design software) because *EMI* reviewed that site in the previous issue.

— Glenn Engstrand

How to Build a Small Harmonium

http://shift.merriweb.com.au/harmonium/diy/index.html

This is actually a reprint (reformatted for the web) from a magazine that is over a century old. This site also includes instructions for how to build a small pipe organ and a small organ keyboard. The narration is quite explicit and detailed with many, many illustrations.

Dan Brunner's Musician/Experimental Builder Page

http://www.shol.com/bruner/

This is a personal web site from a musician and inventor who likes to work in plastic. He has instructions for making a clarinet, four transverse flutes (in various keys), a sectional didjerido, a panpipe, a quena, and a tube drum. Each set of instructions includes a very detailed schematic drawing, a slightly out of focus photo of the instrument, and narrative that reads more like a diary of notes that he took while making the instrument.

Mark Shepard's Flute Page

http://www.markshep.com/flute/index.html

This is a personal web site from the guy who wrote *How to Love Your Flute* (Panjandrum Books, 1980). This site is filled with lots of love for the flute and is targeted to the beginner who wants to learn how to make and play a simple, single octave, whole tone flute.

Webpage of Dennis Havlena

http://edcen.ehhs.cmich.edu/~dhavlena/index.html

This site is (for me) what the web is all about. You get a real sense of Dennis's persona plus instructions on how to make a $20 hurdy gurdy, a low D tinwhistle (with optional drone), a lawn-rake kalimba, a couple of different banjos, a couple of different dulcimers, a whirligig, highland pipes from PVC tubing. You could make everything described on his site and your material costs probably won't exceed $100. He gets the award for most prolific and creative use of ASCII art.

Steel Pan Tuning

http://www.smus.se/musikmuseet/pan/tuning/

Ulf Kronman is a Swedish physicist and steel pan player. He documented, in an extremely meticulous and detailed way, how to make and tune a steel pan and published it on the web. This site also contains details on innovations of the steel pan (e.g. adding reeds to the pan) and its acoustic theory. This site is very well organized and has a very professional look and feel.

David Daye's Bagpipe Page

http://www-bprc.mps.ohio-state.edu/~bdaye/bagpipes.htmlF 255

Well, I'm sure that were you to pour through this entire web site, you could probably figure out how to make penny chanters and Uilleann pipes. David's writing style is a bit circumspective. I think that it would help if you had already made such a pipe before coming here.

Carl's Home-Built Tuba Page

http://www.euronet.nl/users/tubaness/tubas.htm

Not exactly a "build from scratch" approach but, if you already have experience in this area, you might want to check this site out for some additional tips from a fellow inventor.

Bash the Trash

http://www.geocities.com/Athens/Acropolis/5732/btt.htmlF 255

This homespun site features a "Trash Instrument of the Month" where you get a fairly concise yet usefully detailed description on how to make a simple instrument from (you guessed it) trash.

Kevin's Musical Instruments

http://www.indirect.com/www/kbischel/intro2.html

Kevin Bischel's personal web page gives the dimensions for making flutes, pennywhistles, shakuhachi, pan pipes, and folks harps. He also gives some tips on working in wood and plastic in this very straight and to-the-point web site.

The Botar: a New Musical Instrument

http://www.ordata.com/~newmant/botar/index.html

Tom Newman's very personal web site (which includes subjects as power and love, bondage and discipline, sadomasochism and masochism) also has a short description of "the botar" which is basically a computerized guitar. This is more a description of the instrument than a description of how to make it but I believe that there is enough detail here to make something like it. This site is different in that he provides quicktime and AVI files of someone playing it. It comes across like a Chapman stick with an ebo.

Music Maker's Kits, Inc.

http://www.musikit.com/

This is actually a commercial site that sells kits you can purchase. These kits include materials and range from $20 to $1500. Most of the kits are for traditional string instruments.

Welcome to rogo.com

http://www.rogo.com

This is David Shucavage's web site for hobbyists. He published plans that Josh Farthing donated to the Usenet Newsgroup rec.music.makers.builders (more on this in my next article on lists) at http://www.rogo.com/folkstuff/zither.html and he also published plans on making a tubulong at http://www.rogo.com/folkstuff/Buildtubulong.html

harmonium, ubiquitous in India, and mouth-blown *sheng* family of Southeast Asia, China and Japan, to the Western "art-music" repertories for the English concertina and accordion, to the harmonica and the entire "squeezebox" family as used in myriad folk and pop traditions around the world. The center will publish the *Free-Reed Journal* starting in Fall 1999, and is establishing a research archive of primary and secondary materials pertaining to free-reed instruments. For more information, contact the center's director, Professor Allan W. Atlas, Ph.D.-D.M.A. Programs in Music, Graduate Center/CUNY, 33 West 42nd St., New York NY 10036, email freereed@email.gc.cuny.edu; or visit http://www.gsuc.cuny.edu/freereed/

YIKES! ANOTHER BOOK&CD SET FROM *EMI*!

NEW from Experimental Musical Instruments and Ellipsis Arts publishers: We've just come out with *Orbitones, Spoon Harps and Bellowphones*, a book-and-CD compilation featuring the work of sixteen of today's most creative musical instrument makers. Each artist has one track on the CD, augmented by beautiful photos and informative text in the accompanying hard-bound, 96-page book. This set is designed as a follow-up to *Gravikords, Whirlies & Pyrophones*, released by Ellipsis Arts in 1996. The format for the new *Orbitones* set is smaller, with the book made comparable in size to a standard CD case, but fatter. It contains fewer artists than the original *Graviwhirlies* set (but they're just as great!), and sells at a lower price. Simultaneously, an abridged version of the original *Graviwhirlies* set has been released in the same smaller format. In both sets, every track of the CD and every page of the book overflow with the ideas and the originality of the featured builders. The two new sets, as well as the larger original *Gravikords, Whirlies & Pyrophones*, are available here at *EMI*. Look to our display ad on page 10 for further details, including lists of the artist/builders presented.

TWO MORE ISSUES TO GO: As we announced some time ago, the June 1999 issue will be *EMI*'s last, leaving two issues to come following this one. While the magazine will be stopping, other facets of *EMI*'s operations will continue, the great majority of the materials we've produced over the years will remain available, and we even hope to expand some of our operations in some ways — so please stay tuned.

CORRECTION: In last issue's article "Three More from Ángel" featuring wind instruments by Ángel Sampedro del Río, we gave Ángel's address incorrectly. The correct address is: Scalabrini Ortíz 1960-Vill Adelina (1607), Buenos Aires, Argentina. We also neglected to include Ángel's email. It is: bambu@arnet.com.ar.

SORRY, BUT THERE WILL BE A SLIGHT DELAY: In our last issue, at the end of Monte Thrasher's article "Deus ex Machina: Fleshtone and the Godbox Project," we promised a follow-up article in the coming issue. You're now holding that issue, but unfortunately we've been unable to complete the final preparations for *Monte: Part 2* in time to include it here. We'll have it next time around.

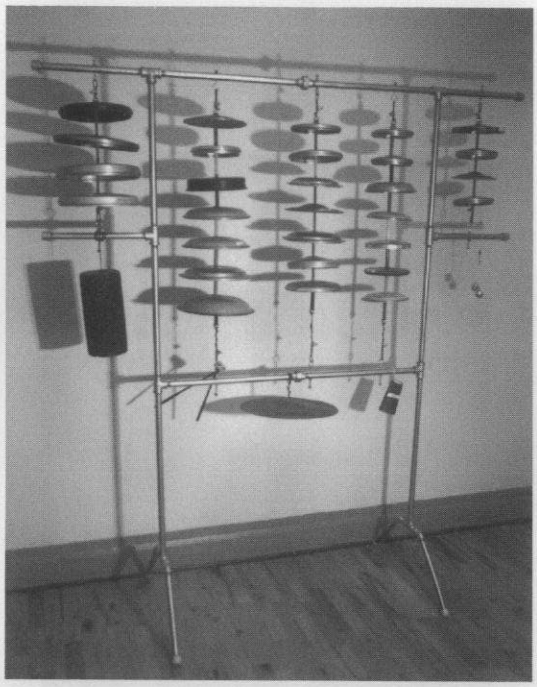
CURTUS SETTINO (email: canoofle.spiritone.com) recently sent photos, seen on the facing page, of a couple of metallic instruments of his own making. Here he describes his Aquaggaswack and Galvanaphone:

THE AQUAGGASWACK is composed of 29 pot lids, one swinging cowbell with internal clacker, one cymbal, two jingle bells, and one mine cylinder (that's what the tag said on it in the antique mall). All sounding elements are attached to a frame made of galvanized plumbing pipe. It can be played with rubber, felt and wood-tipped mallets as well as with snare drum brushes. One special feature of the Aquaggaswack is in its design. The whole thing can be broken down quickly into seven easily transportable pieces.

Each pot lid has its own unique tone and pitch, with most of the twelve-tone scale represented plus a few quarter-steps. The Aquaggaswack can be played solo, like a court instrument, with the many overtones of the lids sustaining, creating rich harmonies. It can also be used very effectively in conjunction with other instruments as either a melodic or percussive voice.

THE GALVANOPHONE sprang forth from leftovers of an earlier Aquaggaswack frame. It features 28 pieces of galvanized plumbing pipe mounted on a wooden frame. The pieces are cut in inch increments from 36" down to 9" long. This particular arrangement creates a two-octave-plus-one set of notes. The first (lower) octave has eighteen notes and the second has nine. The Galvanophone also can be played with a variety of mallets.

The lowest bars sound mostly overtones (because of the lack of resonators) then gradually reveal stronger fundamentals as they get smaller. In the upper register playing a series of either the even lengths (10", 12", 14"...) or the odd (9", 11",13"...) produces surprisingly clear chords. Due to its atypical scale, the Galvanophone doesn't play well with other instruments.

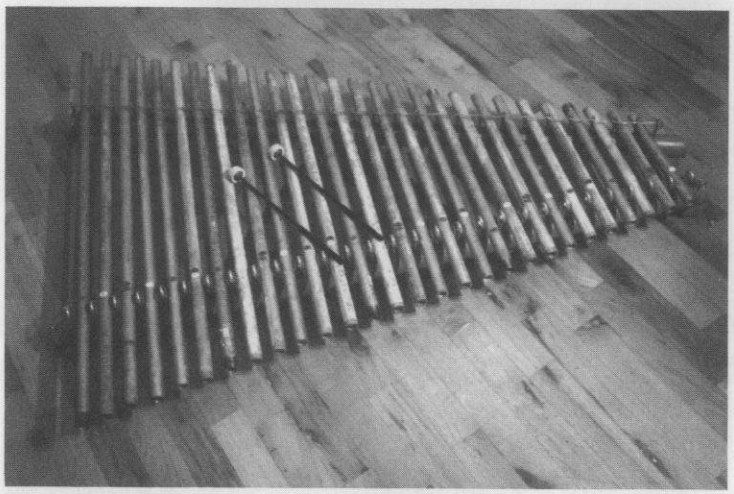


Instruments from Curtis Settino.

Right: the Aquaggaswack

Below: The Galvanophone.

(See his descriptions, preceding page).



AMONG THE INSTRUMENTS created by Austrian sound artist Werner Raditschnig are a unique string-sound construction created for his Feldflächen project, and a grand-scale, highly resonant arrangement of aluminum-pipe called the Aluphon. (The Aluphon is featured in Werner's CD *Autoerotico Stomp*.) Here, in words taken from Werner's recent correspondence with *EMI*, are descriptions of the instruments:

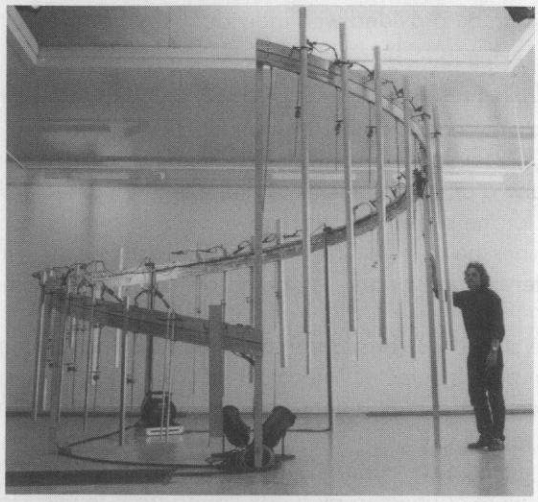
THE ALUPHON — Soundsculpture and Soundmachine

Aluminum in its various ways of use is a material that is available in many different shapes, profiles and pipes, with extraordinary sound qualities. Especially the resonance of the first seven overtones and sound envelopes depending on length, shape and diameter of the profiles offer an incredibly wide range of sounds within the sound spectrum.

In the Aluphon, thirty selected aluminum profiles are fitted moveably to a metal spiral of 4 meters (13 feet) in diameter. Each profile is struck by two hard rubber hammers that are fixed to an electric rotor, each individually remote controlled. The rotors are controlled by an in-out-switch as well as a revs control.

Two kinds of sounds are produced this way: a continuous tone and the percussive tone from the touches of the hammers. These relatively low sound-signals get picked up by different (dynamic and piezo) microphones and other electro-acoustic devices. These signals are collected and mixed at a 32-channel mixing desk and amplified by an 8-speaker surround-system.

So, in connection with the remote-control keyboard for the rotors, all necessary parameters for a perfect musical



Instruments for performance and sound installations by Werner Raditschnig.

Above: The Aluphone. See this issue's cover for a larger-scale print of this photo.

Below: The Feldflächen instrument.

composition are at hand. The sounds, harmonies, and rhythms can be played and controlled in real time (live?), and therefore the Aluphon is a perfect musical instrument to take the listener on a trip through extraordinary worlds of sounds.

Autoerotico Stomp — the performance in two "sensual?/sensuous rooms"

For the performance of *Autoerotico Stomp*, a composition for Aluphon, two separate rooms were created: the room with the sound sculpture — a slightly moving visual object; and the listening-room — an 8-speaker system, arranged in a circle in which the visitor can move about for a three-dimensional audio-experience. As an option, several listening rooms can be provided with individual sound mixes.

FELDFLÄCHEN

Feldflächen is a sound process, for which I built two electric polychords. Both consist of a welded metal frame (1.8 meters/5'2" high; 30 cm/1' wide), six strings (piano and cembalo wire), and a pick-up. Underneath the strings a short fingerboard allows for the placement of a moveable nut, a metal rod, that determines the keynote. The strings are used in free open tuning. The intervals are variably tempered outside the well-tempered system.

The strings are brought into vibration by a vibrating ball with a built-in electric motor. Each of the polychords is connected to a multi-effect processor. For *Feldflächen*, 26 sound effects were especially created.

To achieve an additional playing situation the two polychords were connected by a coil spring from lowest string to lowest string. By touching the spring with the vibrating ball, quiet sounds are induced in the respective sound processor without the ball even being near the instrument.

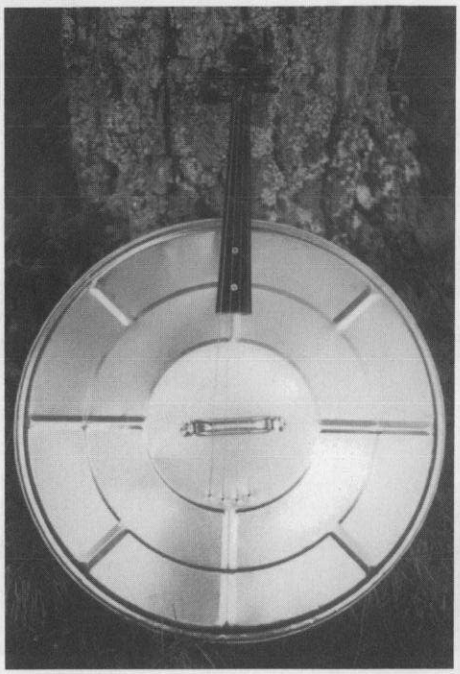
The vibrating ball modulates the sound in three different ways: 1) on the coil spring; 2) by induction without physical contact when near the pickup (within six inches): here the pitch can by modulated by the pressure on the ball; 3) on the metal rod. The intensity of the vibration stays the same, only the pressure on the strings, relative to the nut, can be varied. For the movement of the ball I have devised a special notation.

The instrument was designed and built for the *Feldflächen* project of Galerie 5020 in Salzburg. It is a musical instrument as much as a spatial installation. For the visual side, the connection of two instruments by the coil spring adds to the three-dimensional effect of the performance as a movement in space.

Werner Raditschnig can be reached by mail at Scheibenweg 19, A-5020 Salzburg, Austria. For information specifically on the making of the Aluphon, contact Markus Diess, Audio & Stage Engineering, C.v. Hötzendorf-Strasse 7, A-5020 Salzburg, Austria.

ARTIST AND INSTRUMENT MAKER PETER HEAD (Box 327, Palenville NY 12463) has also recently sent us photos and descriptions of some of his found-object sound-constructions. Here are four from Peter:

[Uppermost photo:] Recycled violin neck mounted to a 30-gallon garbage-can lid. The lid handle is the bridge. The strings can be bowed on either side of the handle. The can lid's flexibility lends to whammy-bar effects.



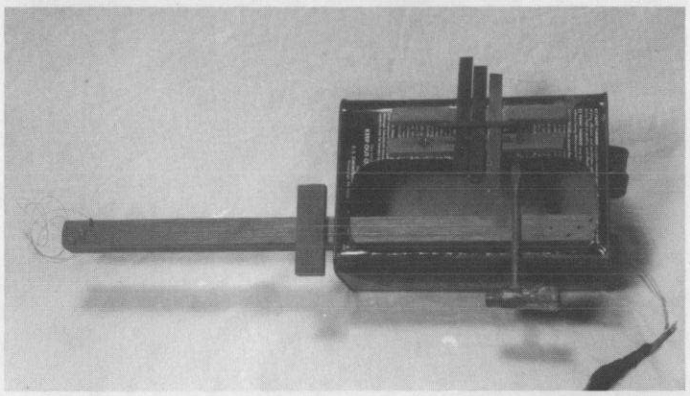
Instruments by Peter Head.

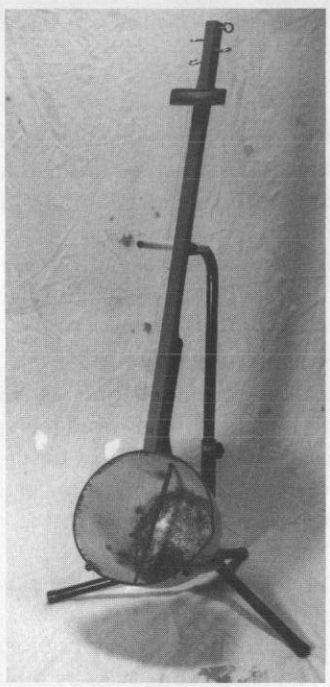
Top: The Perfectly Proportioned Thing

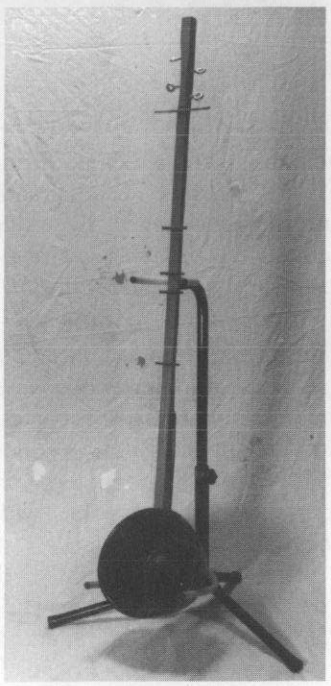
Middle (and in the cartoon on the facing page): The Blue Jay

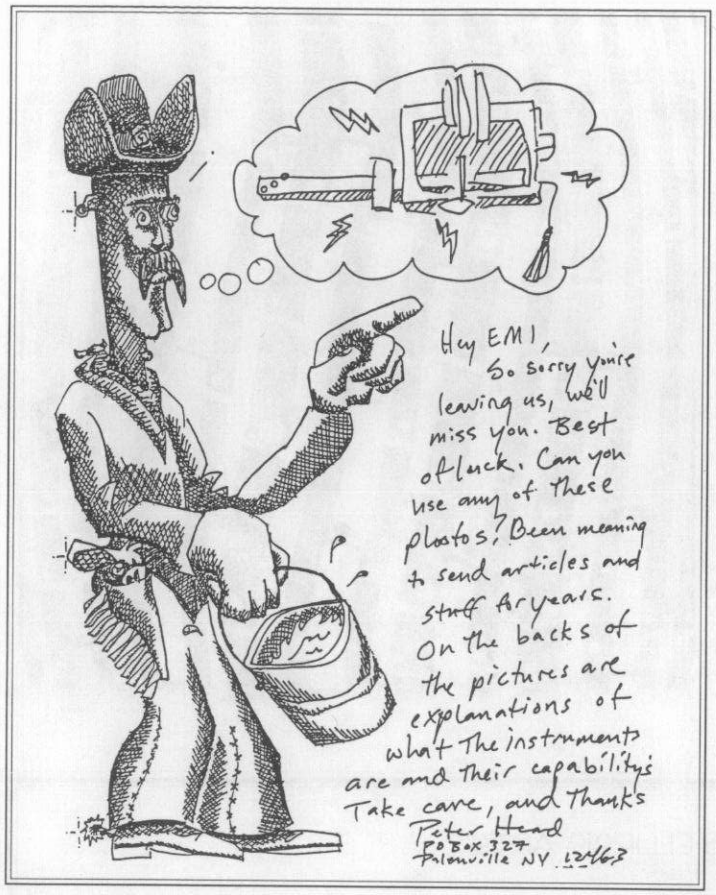
Lower left: First Shit Can Guitar

Lower Right: Second Sauce Pan Guitar





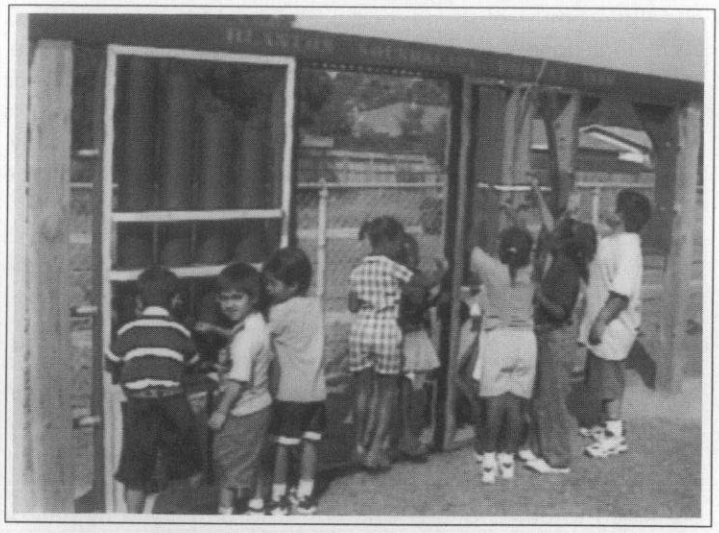




[Middle photo, previous page:] Combination kalimba and dulcimer. Paint thinner can and hack saw blades (plus blue jay feathers). By tuning the three strings to a chord, six-note scales and harmonics can be found by sliding the central block of wood. The movable chainsaw-wrench bridge serves to bend notes up when pushed or pulled.

[Lower left photo, previous page:] Found in our old farm outhouse. Ceramic-coated metal sauce pan with a harmonica (not played in the usual fashion) serving as a nut. Four strings; played as a harp.

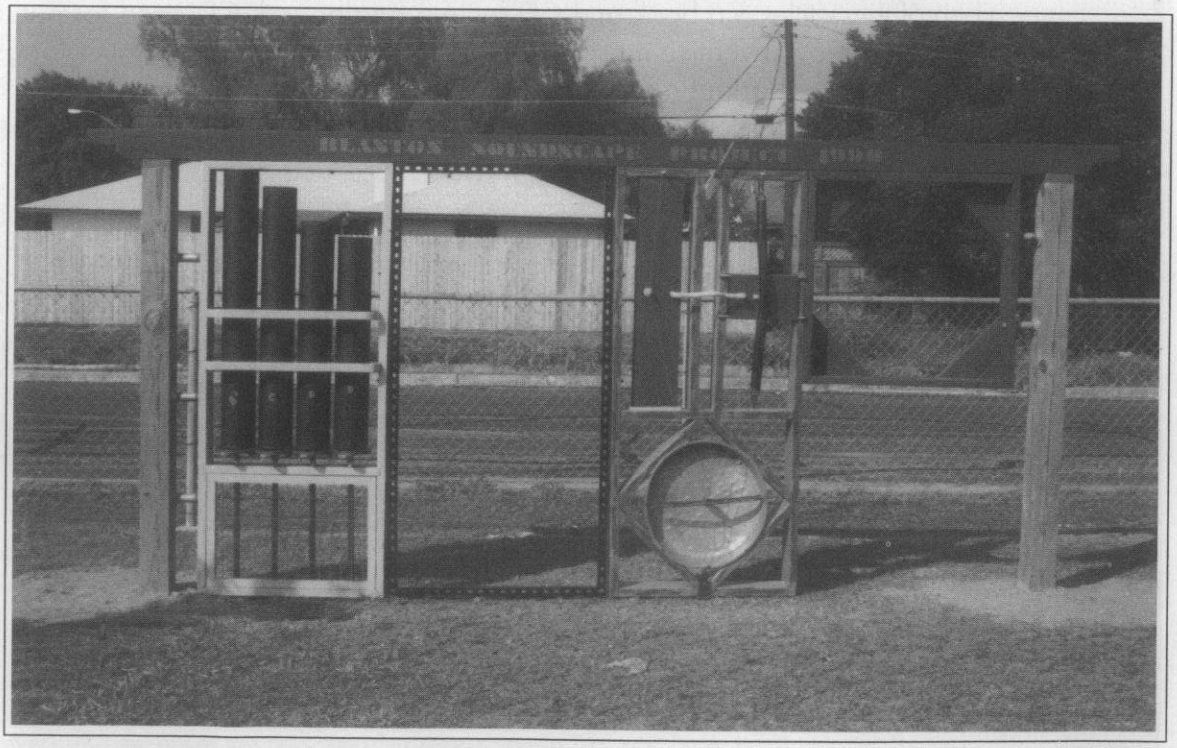
[Lower right photo, previous page:] Ceramic-coated metal saucepan. Tuned to an open chord with frets providing additional tones. The nut is a ballpoint pen cartridge.



THE BLANTON SOUNDSCAPE PROJECT

Sound sculptor Peter Struble (1515 Suffolk Dr., Austin TX 78723), teaming up with Blanton Elementary School in Austin Texas, has been working on The Blanton SoundScape Project, a playground music station on the school's grounds. It takes the form of several spaces, or "panels," within a single larger framework. Each panel will have a different sort of outdoor-able and kid-worthy musical sound-making apparatus built in. Two of the panels — a string bass and a percussion aerophone set, have been installed so far. "This project represents the culmination of several months of 'pro bono' work on the Blanton SoundScape," Peter writes. "The design and the majority of the actual construction was done with salvaged materials and donated time." Describing it in more detail, he continues —

The initial concept was to design and create an outdoor installation which would provide a small orchestra of instruments. The individual panels of the installation each create a discrete



Photos, this page:
The Blanton Street SoundScape Project

and distinct musical sound, and are all tuned to the scale Bb C D Eb. Each panel also demonstrates a different musical principle.

The reaction from the children using the SoundScape has been remarkable. Once shown how the panels operate, students begin to play in concert and actually compose spontaneously. The children have also begun to accept ownership of the SoundScape and treat it with respect and use it appropriately.

The panel frame is made of 6"x6" posts. The upper laminated beam is salvaged lumber. All of the individual wood frame panels are constructed of reclaimed wood which was once part of the deck at the entrance of the school.

The "thunk-a-phone" [in the left panel] is a big hit! It is played by striking paddles which spring up to resonate the air column within the tubes. The thunk-a-phone is tuned Bb C D Eb and can be played by one or more student.

The panel to the far right is a three-stringed bass. Its strings are tuned to Bb, C and D and can also be played by one or more students. The entire frame resonates when both instruments are being played. The empty spaces in the frame are for future panels.

A FLUTE-CLOCK CAPER

by Robert Moore

My interest in automataphonics started as a small boy crawling under and into the workings of a player piano. What I discovered in that first encounter instilled a curiosity in me that has lasted for more than half a century.

I spent a large part of my working career as an Engineering Technician for the Canadian Government — in particular the Magnetics, Arctic and Ocean Acoustics departments of Defense Research Establishment Pacific (DREP). I made "toys" for science. I even got to go to the far arctic to play with them — drilling long holes through the sea ice for lowering the acoustic listening devices or other paraphernalia.

When our shop foreman, Glen May was to retire, I as the foreman-in-waiting, thought it only proper to build a parting gift as a token of our respect, and as assurance that he was leaving the shop in capable hands ..... But what? Something reminiscent of the years of work with Glen: inventions that only the mother could love, ideas that crystallized through that indescribable process of concept to conceptualization, experimental bells and whistles that either worked or wilted in the sub-zero temperatures and most certainly baffled the creatures under the ice. Glen was remarkable in that he could come up with an idea, make it and have it installed before an engineer and draftsman could hand you the drawing.

My vocation as a machinist and avocation as musical instrument maker were inseparable and at times this was apparent when my concept of an "acoustic array" better fit the description of a set of bagpipes than something to be lowered through a hole in the Canadian arctic ice. The answer was obvious: We would make a flute-clock. I had a picture of one in my copy of *Barrel Organ, The Story of the Mechanical Organ and its Repair,* by Arthur W.J.G. Ord-Hume (pub. 1978). Although certainly not in the ranks of Captain Nemo's submarine organ, it could be contrived discreetly in our home workshops.

For the uninitiated, the flute clock is a small barrel organ that was made to tell time, sit on the shelf, sing, and look pretty, while its older and larger relative, the barrel organ, got to be heard in all sorts of places, from the church playing hymns, to restaurants, dance halls, and on the street playing music for the people.

The barrel organ is a mechanical instrument, on which music is made by a revolving cylinder (the barrel) on which the music is programmed with pins and staples. As the cylinder turns, the pins open valves (pallets) through a lever mechanism (keys) and admit wind to organ pipes from a bellows worked by the same revolving cylinder. Variations of the instrument may also operate other sound systems such as bells or gongs, dulcimers or glockenspiels, strings, tuned reeds or music-box type comb mechanisms.

The idea of a barrel organ has been around for a few centuries. The concept was described in the ninth century by the *Banu Musa*, but the conceptualization was first definitely established in the 16th Century. The Hohen-Salzburg organ, which used a barrel, was made in 1502. As well, a carillon in Mechlin (Belgium) in 1583 was mechanically programmed with a barrel. Complex orchestral music set on barrels reached its peak in the 1880s. Beethoven's *Battle of Vittoria* was written explicitly for Maelzel's Panharmonicon, a very sophisticated barrel instrument.

To the diminutive flute-clock, the term "clock" lends some confusion, for historically the term was used to describe not a time-keeping device so much as any mechanism driven by a heavy weight or spring, the potential energy of which was applied to drive the instrument through a train of gears — hence: "clockwork." Yet it could also be more explicit. Many flute-playing "clocks" actually had timepieces and would unleash the potential energy at prescribed intervals to play little tunes by, for example. The toys of kings, one might be found sitting in gilt splendor on a mantelpiece of Frederick the Great, King of Prussia (1740-86) or his brother Ferdinand playing music by, for example, j. Haydn, Mozart or Saliere. And as the "jukebox" of the people, innkeepers and hairdressers entertained clients with flute-playing clocks programmed with the music of Rossini and Schubert.

Our limited time framework prohibited much archival research for working drawings and information. I had some personal resources in my library. My main reference and the source for the preceding text was *Barrel Organ, The Story of the Mechanical Organ and its Repair,* by Arthur W.J.G. Ord-Hume (pub. 1978).*The Mechanics of Mechanical Music,* also by Ord-Hume, and *The Art of Organ-Building*, by George Ashdown Audsley (first published 1905), were secondary sources. However, information on the precise mechanical workings were few and in general the photographs of existing clocks required extensive imagination and interpolation. We chose history as our inspiration and experimentation as our tool of discovery. This, after all is what we, as a research lab, were all about.

Fortunately for me, sometime during the first half of the eighteenth century the elves in the black forest region of Germany came up with a small barrel organ incorporated with a simple bracket clock, usually made very largely of wood. The idea of a musical clock for the people sounded good to me, and was more accessible as the photos in Ord-Hume's *Barrel Organ* book were as close to working drawing as we were going to get. To make

things simpler and of timely appropriateness for a man retiring from the proverbial time-clock, I decided to eliminate the time-piece.

The concept of barrel organs was something of long-standing intrigue with me, and our crew was capable. It turned out to be a challenge. It was a three month process of discovery to contrive the mechanism that finally tootled out the Monty Python theme of "Liberty Bell" with the breathless almost tuneful naiveté of a small boy auditioning for the church choir.

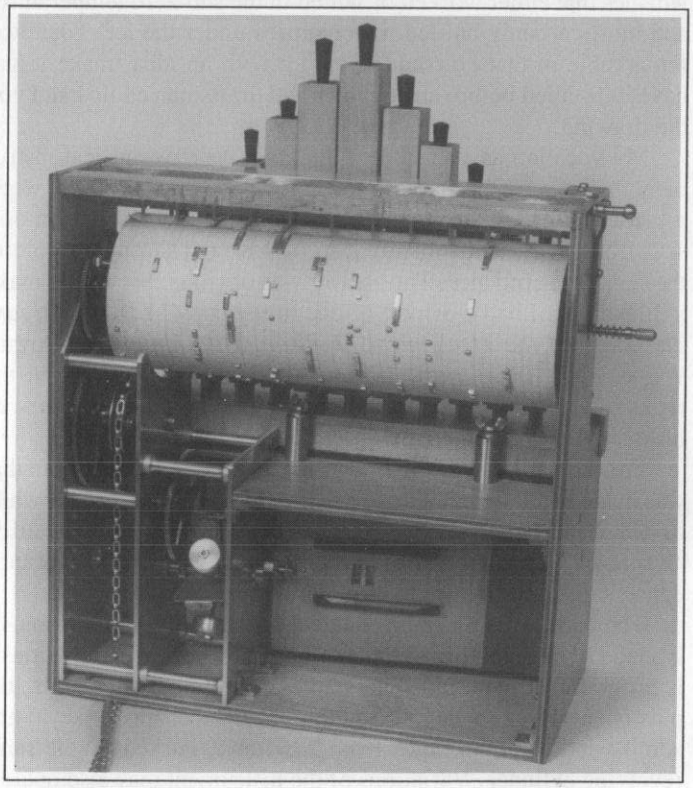
I took my annual holiday sequestered away on a small island with my *Barrel Organ* book in hand and sheaves of paper. The first rough drawing resembled a schematic drawing from Ord-Hume's book but this needed developing into a practical design. Rough measurements were estimated from photographs and text in the book to fit the case dimensions we had chosen. The tunes we wanted required eleven pipes. In the 12th pipe position an extra key would operate a flabby rubber tube salvaged from a whoopee cushion which would make the obligatory Bronx Cheer in the Monty Python theme. Gear ratios were partly determined from the book, extrapolated by simple mathematics and tempered with what gears we had available. I came back to work with preliminary working drawings, and handed them out to my trusty comrades with instructions to come up with the goods in one month — discreetly, of course. Then the job of assembly and fine tuning would begin.

Drawing revisions evolved as the work progressed. The first working drawing depended largely on the wooden case as a framework for the mechanism. However, as we were working from the inside out in the conceptualization, I made a design decision early on: The wooden case would support the bushing for one end of the barrel as well as the reservoir, windchest and keyframe. However, because of the limitations of wood stability, the gear train would be integrated with its own framework. This would consist of three 1/8-inch aluminum plates, spaced apart using aluminum rods of appropriate length, thus holding all the gears shafts and bushings firmly in alignment.

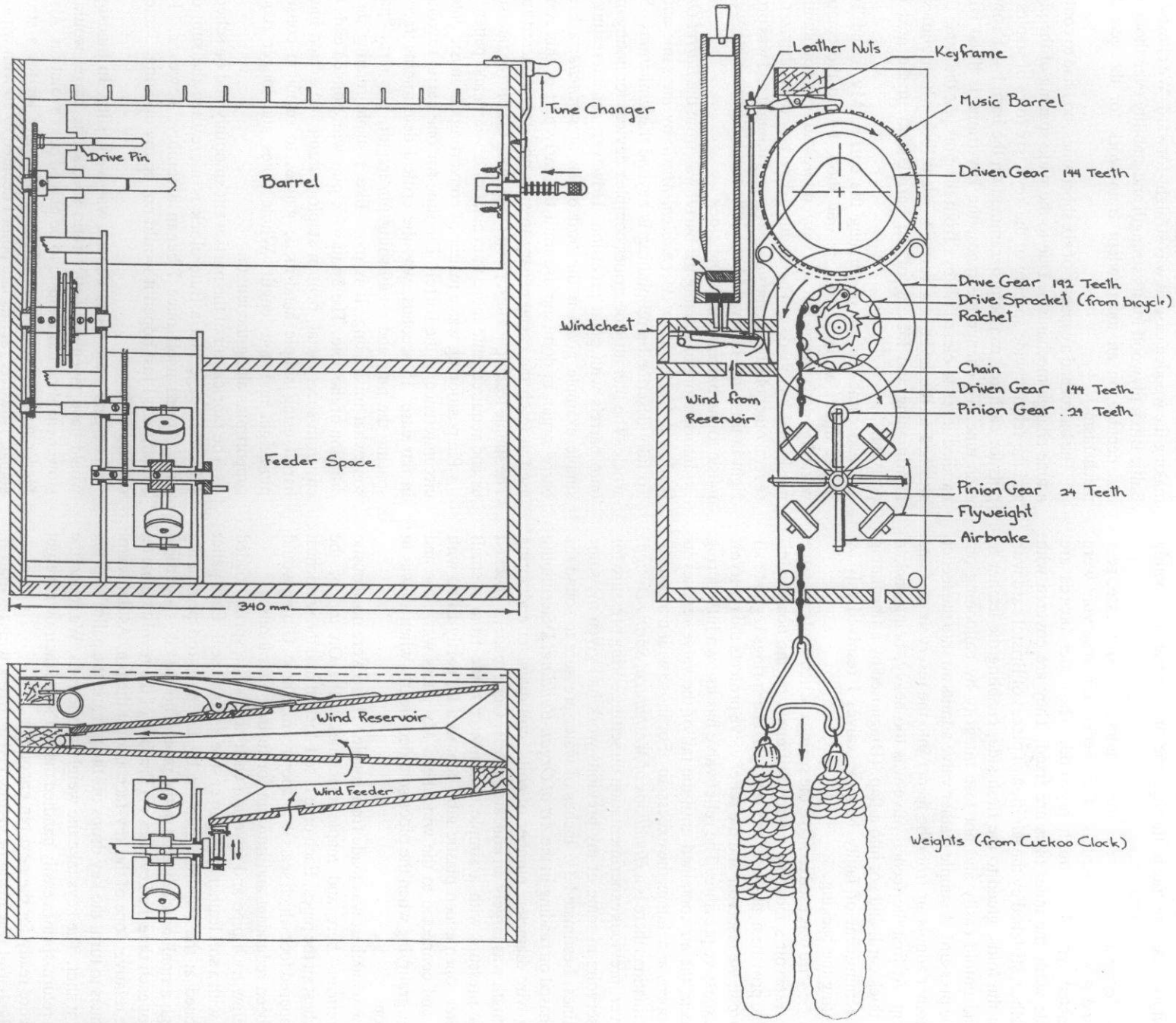
In the initial drawing, the energy to drive the mechanism was from a cord wrapped around a drum with a weight on it. I made an improvement to this when I found that a piece of brass chain I had just happened to fit a bicycle rear sprocket. I decided to add a simple ratchet. This drove the mechanism and when the weights reached the floor, a simple pull on the chain put the mechanism back into action.

I gave the job of making the wooden pipes to Rex Welland — his pertinent qualifications being that he had once made a whistle and he liked working in wood. We chose yellow cedar, a fantastic local wood with great acoustic qualities that machines well. Rex had little trouble coming up with the eleven pipes required. Essentially, these are wooden stopped diapasons, or basic organ pipes. An organ pipe is a coupled system, i.e., the edge tones at the mouth are coupled to the natural frequencies of the column of air in the tube. When the open end of the tube is stopped the pitch drops an octave and softens the tone. The stoppers do double duty as convenient tuning mechanisms for the pipes. Rex had some difficulty with the sealing of the tunable tops — the fit had to be just right in order for the leather to seal against the body. A moot point, but critical. The leather seal on the rectangular stopper did not seal the corners of the rectangular hole until he changed the leather wrapping strip to four separate strips. In 3 weeks, he had them finished beautifully and to a whistle.

Woody (Elwood Godlien) is a whiz at metal fabricating, so I gave him the job of making the keys, keyframe, and a few other parts. Being a welder he used aluminum welding rods for the push-rods that would open the pallets and sound the pipes — a



The Flute Clock. The photo on the left shows the pipe side, with the cover removed and the reservoir visible. The photo on the right shows the barrel side.



The Flute Clock — mechanical drawings

good choice for keeping the lifting work of the pallet to a minimum. His accuracy was appreciated. On assembling his keyframe in the case, the precise clearance on each key made the final positioning a simple job of adjusting the push-rod working length with leather nuts. When it came time to pin the barrel, the keys which read the music through the pins operated smoothly and required no alterations.

I made the feeder and reservoir, windchest, barrel, case, gear train and a few other details. The feeder and reservoir were constructed with 4mm birch plywood. The outer boards are movable while the inner ones are fixed. They are covered with thin leather, stiffened by the addition of pieces of Bristol card with gaps at the folds, glued to the flesh side, enabling the leather to fold and unfold easily and not lose integrity by ballooning out with the pressure. A simple leather valve admits air into the feeder and another admits air from the feeder into the reservoir on a one way trip. At first the feeder valve was too heavy, being backed with a thick card, and got into a flap. (Diagnosed by a fibrillating sound reminiscent of faulty bagpipe valve) I resolved this by eliminating the backing.

Music wire was used to make the springs which apply pressure to the reservoir's movable board. Stiffeners on the board additionally, provide a guide for the springs. The springs regulate air pressure in the reservoir and the relief valve protects the reservoir from excessive pressure. The relief valve has its own little spring that keeps the air contained until the tail of the valve reaches its limit, opens and dumps the excess air. For those with mathematical inclinations there is a *Handbook of Mechanical Spring Design*. However, previous experimentation on setting spring pressure for air reservoirs in some of my previous work had given me some guidelines. I estimated 3½ inches of water pressure to sound the pipes based on reading in the *Art of Organ-Building*. Determining spring wire diameter, number of coils, coil diameter and spring arm length was largely an educated guess. Once made, I checked the air pressure with a simple manometer made from a small diameter, open ended plastic tube bent in a U, partly filled with water and connected to the windchest. My guess was close and further gratifying when the pipes sounded clearly when all was in position.

The windchest was made from maple. There were no acoustic requirements here and maple machines well. On top of the windchest sit the pipes. Each pipe is self-locked into the windchest by a tapered foot which seats in a taper-reamed hole. Gluing would have been redundant and limiting for further alterations.

Below each pipe and covering each hole sits a spring-loaded pallet with a soft leather facing to ensure a proper seal. Each pallet is opened at the required moment by the push-rod protruding through a small hole adjacent to the pipe. The rod takes a vertical descent each time the key rises off the face of the revolving barrel on the relative slope of the key-face against the pin. As the barrel continues to turn, the key drops off the pin and the pallet's spring snaps it shut. The keys take the weight of the rods. We found the pallet return-springs easily handled the rod's and their own weight and were ready for the next pin encounter.

The barrel was made of yellow cedar, like a whiskey-barrel, but cylindrical, with twelve staves glued to each other and to the two end-disks. This was turned and sanded on a lathe to remove the facets and make it smooth.

For the gear train I used off-the-shelf gears — Boston Gear Works — simply because they were there and they fit. Because the gears are such a fine pitch, the center distance had to be carefully established to ensure smooth running. The three aluminum plates for the gear train housing were stacked, drilled and reamed for the bushings and spacers to ensure correct alignment. Everything fit together like "clock-work."

By this time we had developed a real working drawing, so making the wooden case fit was straight-forward. We chose 8mm Baltic Birch plywood for its strength and stability even though we had decided on an independent framework for the gear-train mechanism.

The barrel had a capacity of six short tunes, so I had to contrive a tune-change mechanism. Due to the wide spacing of the pipes, and the relative wide spacing of the keys, six rows of staples and pins for each key can be programmed on the barrel — a row for each tune. To change the tunes, the key-frame is lifted with a handled lever to clear the keys from the pins. At the same time, attached to the lever is a vertical indent lock which allows the repositioning and locking of the barrel shaft in the next tune position.

Next came the job of pinning the barrel. My friend Terry Miller didn't actually work in our shop, but in the computer wizardry department. He is very interested in programmable music and has made a Theremin, a key board synthesizer and several other electronic musical devices. I thought and was proved right in this, that he would have little trouble converting written music to the barrel of the flute clock.

Information for pinning the barrel was from the *Barrel Organ* book and *Mechanics of Mechanical Music* by the same author. To fully describe barrel pinning is beyond the limitations of this article. The literature describes complex devices for noting music onto barrels with great precision. However, an interesting and simple example given is the bird organ or *serinette*: a French barrel organ in domestic use until the early part of this century used to teach the caged canary to sing popular or sacred tunes. The simple techniques described for pinning the bird organs suited us and required little more than a set of dividers and paper.

Pin positioning was a matter of converting the music onto the circumference of the barrel. The time for one barrel revolution, in our case, 15 seconds, was the critical determining factor in spacing the pins and establishing pin length. The term "pin' is somewhat misleading. It is more like a staple running the full duration of the note. The 3mm wide pins with pointed ends were cut from sheet metal, bent in staple fashion and driven into the barrel using simple hand-made gauges to maintain consistent pin-height and note-length. Whole notes and longer required support pins along the length.

The fabrication of the parts went smoothly and on schedule. Tthe old adage that a flute clock is more than the sum of its parts proved itself once I began assembly; however, I was committed. I just hoped it would not be my undoing. Time was running out.

The gear ratio I had chosen was a bit slim. In hindsight, I would have given it a better ratio so that the barrel would turn slower enabling more music to be played per revolution. Also the feeder would pump more often giving more air for a stronger sound. However, at this late point I decided to go with what I had — there were many details to work out for the instrument to play and sound good without stopping. Because the whole thing turned, pumped and sounded the music using the energy of the chain weights, it was necessary to make everything happen with as little resistance as possible. The leather for the feeder and reservoir had to fold and unfold effortlessly , so care in selecting the leather,

backing it in thin Bristol card and making the folds neat was very essential. Also, I found that the leather pleats in closed position were increasing the effort required. The connecting rod to the feeder was shortened to pull back on the positioning of the feeder travel, allowing the feeder to pump without having to close the pleats and tightly. Another finicky detail was determination of the correct weights on the flywheel. I ended up using heavier fly-weights than I had first envisioned to increase momentum and ensure smoother running.

Well, Glen's retirement was fast approaching and the "clock" was still in the squeaks of infancy. I persisted, tweaking and tuning into the wee hours right up to the night before. The flute clock was speaking, although rather mechanically with the clicking of the keys and a slight respiratory problem when more than two pipes were required to speak at once. The respiratory disorder was considerably alleviated by decreasing the size of the holes in the foot of each pipe, decreasing the amount of air required to sing without taking its breath away. With the adjustments, the "clock" spoke freely in a soft whimsical voice. We were delighted with the sound of the pipes. However we were disappointed that the working pressure of the organ was insufficient to sound the Bronx Cheer mechanism on the 12th key. More research is yet required to come up with a low-pressure Bronx Cheer mechanism.

There was space on the barrel for six very short tunes, but we had time for only two. The first, as mentioned, had to be "Liberty Bell," the theme for Monty Python of which we were all fans. In repetition, the tune flowed well. The second was a simple contrapuntal J.S. Bach tune that also worked well in repeated cycles. We were ready for presentation.

The retirement party was memorable. After all the fine speeches, accolades and comradeship, Glen was liberated to the sweet refrain of "Liberty Bell" with a "Bronx Cheer" mechanism implemented manually by the flute-clock team. (To misquote the Bard, "farting is such sweet sorrow.") All this — the flute-clock adventure, the retirement party, my own retirement, are several years past, however the flute-clock team-work, in my mind, high-lights the achievements of the Defense Research Lab.

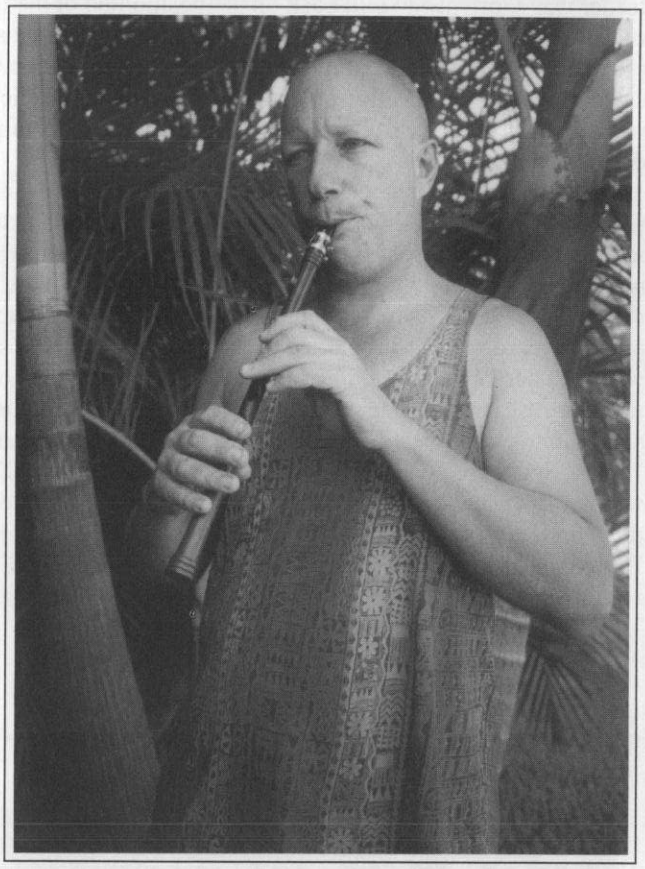
Rob Moore is a retired technician, living in Duncan, B.C. Currently he is building musical instruments — in particular, Irish and Northumbrian Pipes. He is keeping up his interest in auto-mataphonics with the acquisition of a locally hand-crafted Dutch Street Organ. He welcomes communication from readers. His ghost-writer who translated Rob's Shopanese into English is his partner, Cynara de Goutiere. Rob can be reached at 3895 Hillbank Road, Duncan, B.C., Canada, V9L 6M1; phone (250) 743 5791.

HYBRID WINDS

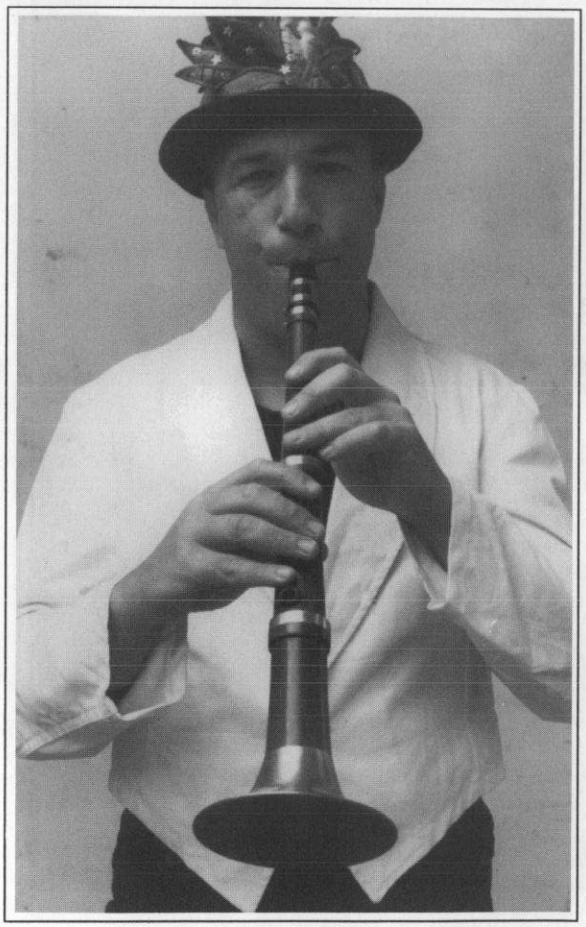
By Linsey Pollak

When I was about fifteen I had a dream that featured a wind instrument whose sound I remembered clearly on waking. It reminded me of a somewhat mellow crumhorn or a sort of high-pitched baritone sax. That sound eludes me now, but I have always been chasing that elusive, dreamt, wind-instrument sound.

I started my instrument making journey 25 years ago making bamboo flutes. That quickly led to a longer stint of making wooden renaissance flutes, and an interest in other renaissance and medieval winds. But the real love affair began 20 years ago with the Macedonian *gaida* (bagpipes), and so I traveled to Macedonia for eight months over three successive trips in order to learn to play and make them. That love affair has since taken me on a myriad different musical journeys, and although I still make gaidas, my main wind instrument making activities of late have been in the area of hybrid winds. These are wind instruments that are variants of existing instruments, or are deeply inspired by other wind instruments. This article describes some of them.



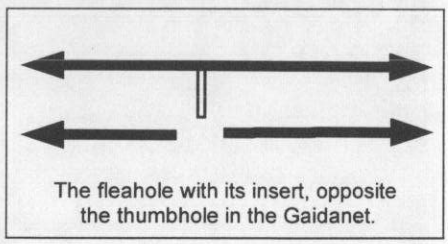
Linsey Pollak plays the Gaidanet



The Saxillo

THE GAIDANET

As the name implies, the *gaidanet* is a hybrid of the gaida (Macedonian bagpipes) and the clarinet. It is actually a very narrow-bored clarinet-type instrument (cylindrical bore and single lip-blown reed) but the fingering and tuning resemble that of the gaida. The beauty of the gaida is the style of ornamentation that is used, and that is determined to a large degree by the existence of a fleahole which is the first fingerhole (exactly behind the thumbhole). The fleahole is a very small hole with a small tube inserted which extends into the bore (you can use a chicken feather quill or a biro refill tube about 8 -10mm long). This has the effect of raising the note being played by a semitone when it is opened. (In fact it only works for the top half of the octave in Macedonian gaidas, but for the full range in Bulgarian gaidas which have a more conical bore). This enables a unique style of playing and ornamentation.

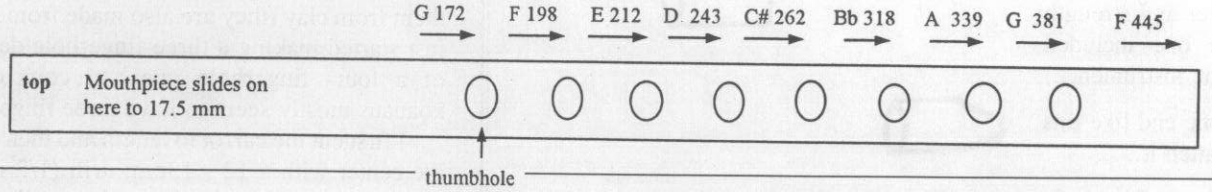


The fleahole with its insert, opposite the thumbhole in the Gaidanet.

What I wanted to do was to have access to the gaida style of playing and ornamentation while playing a lip-blown instrument like a clarinet. I experimented first with a clarinet mouthpiece and a bore diameter of 13mm. With a bore of this size the open fleahole notes were very muffled, and I eventually worked down to an 8mm bore diameter using a sopranino saxophone mouthpiece (not soprano) which works very well. I made the initial instruments in wood (turned from Brigalow and Gidgee — local Australian

Measurements for a clarini in "A" Hidzaz tuning (F G A Bb C# D E F G)

Using 12mm OD aluminium tube with 1.2mmwall thickness (ID : 9.6mm)
Fingerhole size 6.5mm
Sopranino saxophone mouthpiece
Measurements in mm.
Distances show distance to centre of fingerhole from top of tube (and note played with open hole).



hardwoods), but I've also made them in bamboo and aluminium (read the following section on clarinis). The sound is very soft, but the instrument comes into its own as an electroacoustic instrument. I use a woodwind pickup called a Danabug (made in Scandinavia) which works superbly for this instrument.

CLARINIS

After developing the gaidanet I didn't take it any further for a few years; however, in early 1997 I developed further the idea of amplified narrow-bore clarinets and developed the *clarini* (or family of clarinis). Basically these are narrow-bore clarinets that I make out of alumimum tubing (ID. 9.5mm), though the material could be plastic, bamboo, wood, etc.

In performance I always use them as electroacoustic instruments with the pickup inserted directly into the bore of the instrument just below the mouthpiece. They can of course be played without amplification but are very quiet instruments. Because these instruments do not cross-finger, enabling a chromatic scale, I make a family group of instruments with different scales and tunings and a shared interchangeable mouthpiece. They can be built in a whole range of tunings. Because one of my main influences is music from Eastern Europe I use various Turkish and Greek scales as a basis for tuning. The advantage for modal playing is that each instrument is firmly based in the scale to which it is tuned.

THE SAXILLO

For many years I was obsessed with the sound of the *tarogato* (a Hungarian conical-bored single-reed instrument somewhat resembling a wooden soprano sax but with a much mellower tone, partly due to the bore profile and mouthpiece design). It was developed late last century by Schunda and later by Stowasser in Budapest. I was lucky enough to eventually come across a very good Stowasser tarogato, but I also had a real ambition to design a tarogato-type instrument that had no keys.

There had been an earlier Hungarian folk instrument also named tarogato which was a double-reeded shawm- or oboe-type instrument. The modern tarogato, although carrying the same name, is quite different. The tarogato has since the end of the last century been a keyed instrument with a gradually changing key system that became very similar to the Albert system found on some clarinets. The tarogato, however, overblows an octave (like the sax) because of its conical bore. I wanted to design a simple conical-bored single-reed instrument with no keys — a sort of folk sax. Because the design and intent was similar to a tarogato I called it a *tarogatino* (it was to be smaller and pitched in C rather than Bb like the tarogato). In 1988 I began experimenting and built my first tarogatinos, and over the years I have modified the design (modifications are mainly very small changes to the mouthpiece and upper bore). I make them in wood (usually an Australian acacia called Gidgee - *Acacia Cambagie*), step boring them on a lathe and then reaming them to the final bore taper. I have used modified clarinet mouthpieces and sopranino sax mouthpieces.

The instrument has gradually changed over the last ten years and I now call it a *saxillo*. It is still pitched in C with the lowest note being the D above middie C, and it has a cross-fingered chromatic range of just under two octaves. The mouthpiece is a heavily doctored clarinet mouthpiece with an insert that reduces the bore of the mouthpiece. The saxillo has a spun brass bell, but this aspect of the instrument is currently in the process of change. The sound is like a mellow soprano sax.

THE HYBRID ZURNA

The *zurna* is a very loud! and fantastic Turkish double reed instrument. The *suona* is a very loud! and fantastic Chinese double reed instrument. (You either love them or hate them).

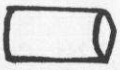
I wanted to combine the sound and tuning of the Turkish zurna, which has a virtual conical bore (actually cylindrical, but with a sort of peg insert at the top end of the bore below the reed that makes it a "virtual conical bore"), with the Chinese suona, with its greater accuracy of pitch and extended range due to its conical bore. So in my hybrid zurna I've used the bore profile and the attached brass bell of the Chinese suona in conjunction with the tuning and body shape of the Turkish zurna, combined with an oboe staple and a zurna-shaped reed made from a plastic drinking straw (rather than flattened cane). In the sidebar on the following page I include details on making these reeds for those people who have various "folk shawms" without working reeds.

The instrument works extremely well and is quite similar in sound to the Turkish zurna with perhaps more activity in the upper harmonics. It has a range of nearly two octaves (if the reed is working well) and it's definitely an outdoor instrument. The zurna comes into its own when played in pairs (one instrument droning, or both in unison) and played with a *davul* or *daouli* or *tapan* (large double-sided drums played with one small and one large stick). There are literally hundreds of varieties of this instrument in different parts of the world.

ZURNA REED MAKING

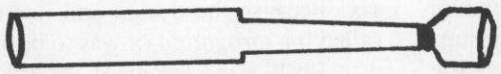
I currently use an oboe staple for the zurna in A (5-finger note is A).

Cut a 15mm length from a plastic drinking straw (use same diameter and strength as the one included with the instrument).

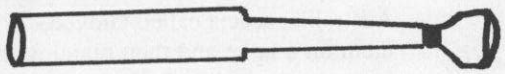


Cut one end like this and flatten it.

Tie it to the staple (oboe staple) with cotton so that the staple only just extends beyond the binding (inside the reed).



Trim the end of the reed (with scissors) so that it has a slight curve and is 7mm long. Also trim the corners.



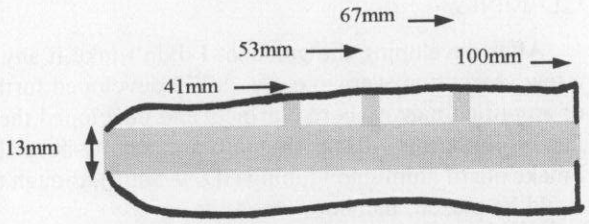
Now flatten out the reed very carefully by drawing your front teeth along the length of the reed. Test the reed and if it is still too hard to blow keep flattening it out with your teeth. You will find that you need to keep doing this for the first few days as it tends to revert to its original round shape.

When you first try to play you will probably find the reed too hard to blow, so flatten out the reed by drawing your front teeth along the length of the reed. Do this very carefully so as not to destroy the reed.

THE CARROT FLUTE

The carrot flute is exactly what the name implies — a flute made from a carrot. It is an end-blown flute played in the same way as the Turkish *ney*, Bugarian *kaval*, Macedonian *supelka* or the New Zealand Maori *koauau*. In fact it is incredibly similar to the koauau. I'd been making carrot flutes for a few years when I went to New Zealand and while I was there I was introduced to the koauau by a maker who made them from clay (they are also made from bone). I had just started making a three-fingerhole design instead of a four- fingerhole one and coincidentally the koauaus mostly seem to have three fingerholes.

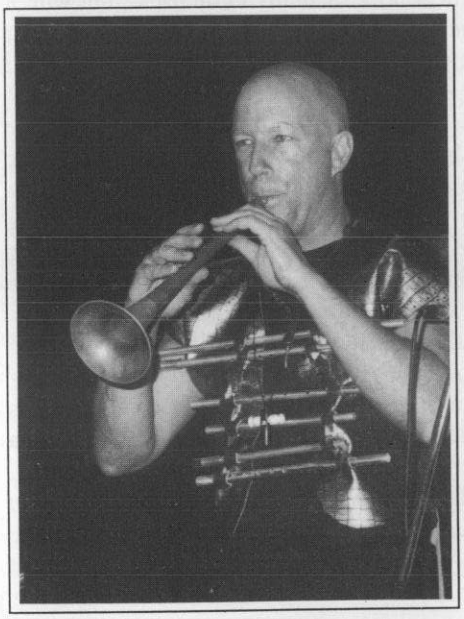
I first cut the carrot to length and then drill it down the center with a 12 - 13mm drill (1/2 inch). Then, using a carrot peeler, I shave the smaller end so that the edge around the hole is sharp (you need a nice fresh, crisp carrot). Then I drill the fingerholes, usually with a 6 -6.5 mm drill. These measurements are suggestions only, but they are a starting point. All sorts of tunings are possible.



Suggested carrot flute dimensions

THE RUBBER GLOVE GAIDA

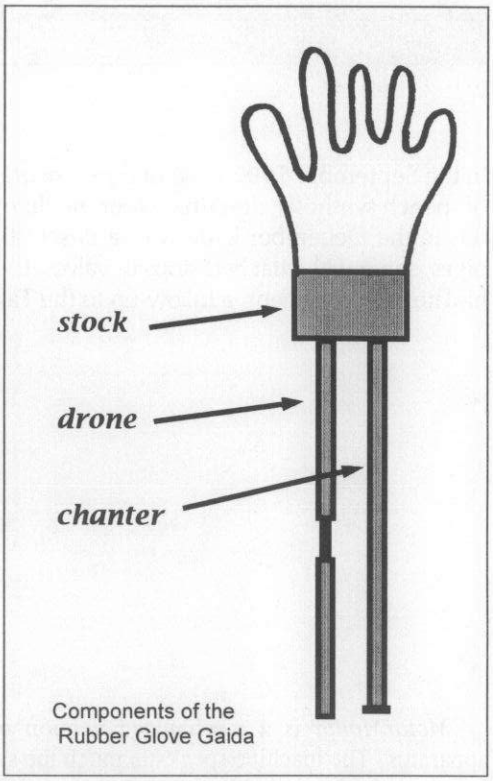
The Rubber Glove Gaida is also what its name implies — a gaida (Macedonian bagpipe) made from a rubber glove. Well, what I mean is that the bag is



Left: The Hybrid Zurna

Right: Hybrid Zurna with a rubber-glove drone

replaced by a rubber glove (the type you use for doing the washing up). I've also hybridized the design of the chanter and drone. The gaida typically has a chanter with a single reed and one drone. It uses a whole goatskin with the blowpipe and drone attached to the two front legs and the chanter fitted to a stock tied into the neck. I've raised the drone by an octave and placed it parallel to the chanter in a double stock (similar to some of the French bagpipes for example). I've simplified the outer design of the chanter, but the bore is the same (very slightly conical, but operating more like a cylindrical bore. As with the gaida, the tonic (that the drone is tuned to) plays with three fingers down. It also uses the fleahole system described earlier in the section on the gaidanet. I've made these instruments in D and in A. There is a third hole in the stock that receives a tube from a foot-operated air mattress pump. I've often performed and recorded with this instrument and its sound is excellent. Very occasionally it explodes during a performance, but the audience assumes that it is part of the act. Most gloves will last for six months, depending on the quality of course. When selecting gloves you need to be particular about the air pressure that they deliver when blown up (it varies depending on size and the thickness and quality of the rubber). With a bag the air pressure can be controlled, but with a glove it is more or less constant and so must provide what the reed needs. I've only tried rubber gloves with single reeds and not double reeds. Some double reeds will need more pressure than a normal rubber glove can deliver.



Components of the Rubber Glove Gaida

OTHER HYBRIDS

Other hybrids include: *The Camping Stool Flute, The Watering Can Clarinet, The Microphone Stand Slide Bass Clarinet, The Inflated Trouser Bagpipe,* and *The Baby Bottle Pongi.*

Linsey Pollak lives on the Sunshine Coast in Queensland, Australia, and apart from making and designing instruments he is currently working on a one-person show called "Playpen" (where he is an 18 month old baby creating his own magical, musical world within the confines of the adult-imposed playpen) and a large outdoor music theater piece called "Bim...BamBoo!!" in which the whole set and all of the instruments are constructed from bamboo.

The musical group *Xylosax*.

Linsey Pollak, second from right, plays the Rubber Glove Gaida, while the remaining group members play the Humarimba (a marimba suspended between two humans) and djembe.

In the September 1997 issue of *Experimental Musical Instruments* (Volume 13 #1), author Martin Riches gave us a history of the art of speech synthesis, describing four mechanical and electronic talking machines from the 18th, 19th and 20th centuries. He followed this in the December issue with a description of his own Talking Machine, which uses about thirty differently shaped resonators pipes, some with attached stops or valves, to reproduce the sounds of spoken English. Now, in the article that follows, Martin describes his latest development: a follow-up to the Talking Machine in which the multiple pipes are replaced by a single, integrated device.

MOTORMOUTH
A Speaking Machine

By Martin Riches

MotorMouth is a mechanized version of the human vocal apparatus. The machine speaks in much the same way as a human being: with air, with a larynx and with moving lips, tongue and teeth. Like a human being, please note! — without a loudspeaker and without any form of recording.

The machine consists of:

the lungs: a blower

the larynx: artificial vocal chords and two valves

the mouth and throat: a resonant cavity lined with soft rubber

the tongue: a cylinder rotating within the mouth cavity with a section which can be raised and lowered.

a muscular system: eight precision stepping motors

a nervous system: a set of eight sensors, a power control system for the motors and a small computer.

LUNGS

MotorMouth's air supply is provided by a simple blower or fan, as used to cool off electronic equipment. It blows air into the larynx at a pressure of about 5 g/cm^2.

LARYNX

The natural larynx has two modes of operation: to make voiced sounds, the vocal chords vibrate together like the lips of a trumpeter. They can also open up to provide a stream of air to speak sounds like H, S and SH. I didn't even attempt to reproduce this dual-purpose mechanism exactly. Instead there are two separate valves. One valve leads the air from the blower onto a brass reed causing it to vibrate — like the reed pipe in an organ. The other valve releases a stream of air directly into the vocal tract. The opening of each valve is controlled by a motor, so that the amount of air can be precisely regulated just as required — not merely full blast or tight shut. A third motor operates a bar which runs up and down the base of the reed to tune the pitch of the voice over a range of about an octave. This is used to reproduce the natural inflection of the voice — and perhaps MotorMouth could also be taught to sing.

TONGUE

The human tongue is an extraordinarily agile lump of muscle and it might seem to be quite impossible to reproduce its operations mechanically. However phoneticians have long since plotted all the many up-and-down and forward-and-backward movements which are required to shape the resonant space inside the mouth. My mechanical tongue is a cylinder with a hump, or blunt fin, on one side. This cylinder turns within the semi-circular mouth cavity, so moving the main restriction, the fin, backwards and forwards. The central part of the fin, corresponding to the tip of the tongue, can be raised to increase the restriction formed by the fin. When fully raised, it touches the roof of the mouth, so closing the mouth cavity entirely.

MOUTH AND THROAT

One side of the mouth and throat is formed by a thick aluminum base-plate with a bronze bearing for the tongue axle. The opposite side is a thick sheet of acrylic glass through which the movements of the tongue can be observed. The roof of the mouth is covered with a layer of soft rubber to provide some realistic damping.

LOWER TEETH AND LIP

The teeth consist a small metal blade mounted on top of a vertically sliding block. Working in combination with the tip of the tongue, MotorMouth's teeth and lower lip are used for articulating sounds like SH, F, S, and T. The tip of the tongue is first raised almost to the roof of the mouth, so forming a flat jet of air which hits the teeth making a hissing sound. It is possible to place the teeth, lips and tongue in positions which modulate this hissing into realistic F, TH and SH sounds. For a dependable S sound of sufficient loudness, I had to resort to a special hissing whistle built into the teeth. This comes into play only when the

teeth are shut and the outside of this whistle is uncovered by lowering the lip. The lower lip is another sliding block, similar to the teeth, but with a soft rubber cushion on top. The cushion makes the airtight closures necessary for P and B sounds.

In natural speech, T sounds are formed by first holding the tongue, teeth and lips in the S position, followed by a sudden release of air using the tip of the tongue. I found I could not get the tip of the tongue to move quite fast enough to speak anything but a rather soft T, so this rapid air release is now performed by a rapid movement of the large air valve in the larynx. Maybe humans could articulate a T sound in this fashion - without moving the tip of the tongue - but it would certainly take practice.

NOSE

The nasal passage, lined with foam rubber, is connected to the mouth cavity by a valve. This nose valve, like all the other moving parts, is driven by a stepping motor. It is opened to pronounce M and N sounds.

MUSCLE SYSTEM

The speech organs are moved by eight stepping motors, all connected to a small computer. These motors are each fed a stream of pulses which determine how far and fast they move, and in which direction. When such a motor receives a pulse it makes a small step, like the second hand of a watch — hence the name *stepping* motors. The motors I use take 50 steps to turn through 90 degrees. This permits precise positioning of the speech organs. However, there is a definite limit on how fast these motors can be persuaded to move without missing a step: my motors are sufficient for deliberate speech — not fast enough for rapping. The circular motions of the motors are translated into linear motions by cranks and bowden cables — like the brake cables of a bicycle but thinner. The mechanism looks extremely busy when the machine starts talking.

NERVOUS SYSTEM

The motors are controlled by a small single-board Z-80 computer. The computer also reads a 12-button key pad for selecting different talking programs and it reads eight sensors. These sensors provide the control system with feedback information about the position of the speech organs — similar to the nerves inside the human mouth.

PROGRESS SO FAR

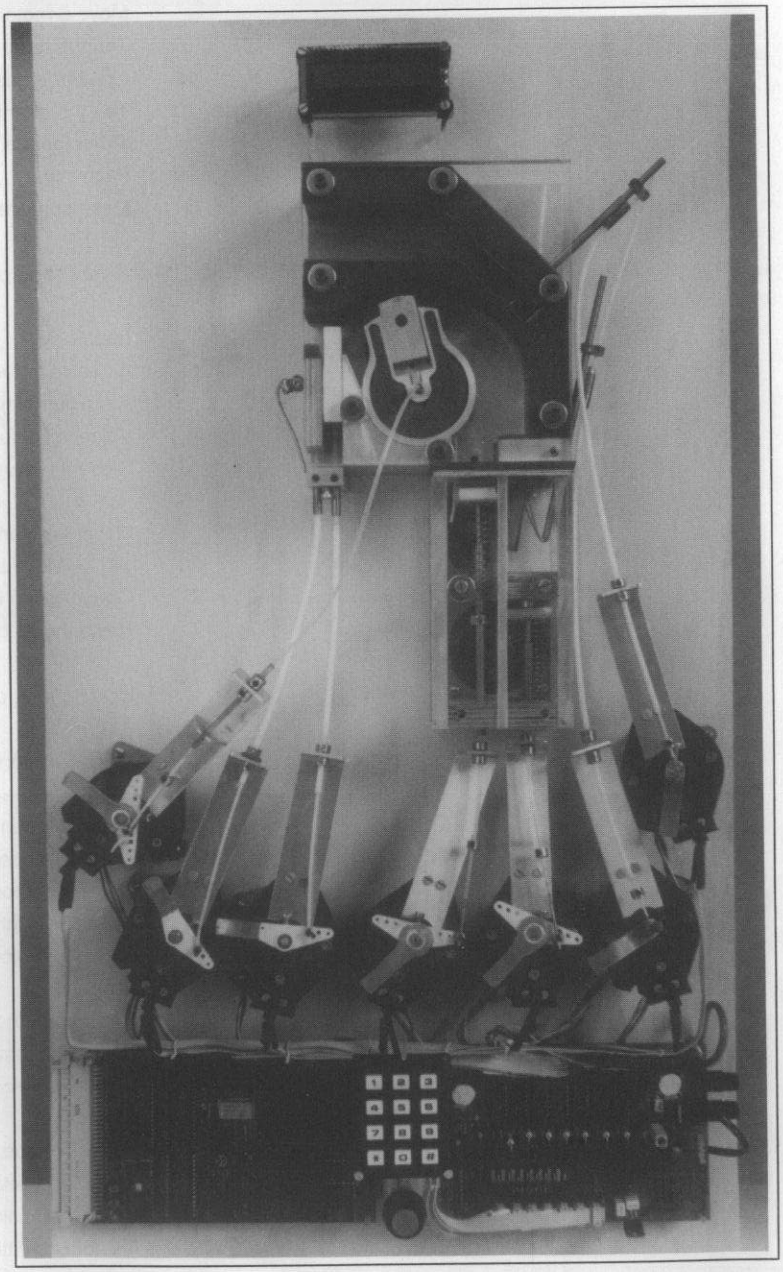
The machine has now reached a stage where it can speak all the English vowel sounds, all the semivowels, such as W and Y, and all the English diphthongs. It is currently being taught to speak various consonants and to count from 1 to 10 in English and in German.

PROGRAMMING

I first type the instructions on my personal computer and then transfer them into the memory of the Z-80 computer which actually does the work of controlling the motors. The sidebaron the following page shows the instructions required to make MotorMouth say "three."

To program a new word I start with the first sound (in this case "TH"), trying it by itself, adjusting it if necessary and then adding on the next sound, slowly building up the word. Usually, it takes a few hundred attempts to get a word to sound even approximately right. I prefer to keep my programming sessions short, typically half an hour, altering the instructions and trying out a new version perhaps every two minutes. If I continue longer my ears get tired and I become accustomed to the machine's mispronunciations.

Unfortunately, it is seldom possible to use standardized groups of instructions (macros) as building blocks for building up words. Speech sounds and their timings vary according to context. Each sound is adapted by the sound that came before and anticipates the sound that will follow. The rule seems to be that the tongue and the other speech



Martin Riches' *MotorMouth*, a work-in-porgress. Below the mouth and larynx are seven of the eight stepping-motors. At the bottom are the computer and interface. The LCD display is at the very top. The eighth motor (which drives the tongue) together with the air blower and the power supply are mounted on the back of the baseboard.

MOTORMOUTH PROGRAMMING: A One-Word Example

Here are the instructions required to make MotorMouth say "three." For clarity, I have omitted some coding details required by the Z-80 assembler programming language and added some explanatory notes.

Instructions to be performed simultaneously are linked by a bracket. The name of the motor is followed by two numbers. The first number tells the motor which position it should go to. The second number is the speed; the smaller the number, the faster it goes. The other instructions, not in brackets, are performed one after the other.

text "THREE"			Send the word "THREE" to MotorMouth's liquid crystal display
			Move 6 motors simultaneously to the starting position of "TH"
Tongue	10	15	Tongue to front of mouth, slowly.
Lips	36	10	Lips three quarters open.
Teeth	13	10	Teeth a quarter open.
Tip	20	10	Tip of tongue a quarter open.
Pitch	8	10	Pitch low.
Nose	0	5	Make sure the valve leading to the nose is closed.
Wait	2		A very short pause.
			Speak "TH"
Air	48	5	Air valve to full open. "TH" starts sounding now.
Wait	10		A medium pause while "TH" continues.
Voice	40	5	Voice valve full open. Start voice ready for "R" sound.
Air	0	5	Close air valve, end of "TH" sound.
			Move 3 motors simultaneously to speak "R".
Tongue		20	10 Move tongue back in an "R" movement, slowly.
Teeth	32	7	Open teeth a little, medium speed.
Tip	12	7	Raise the tip of tongue almost to roof of mouth.
Wait	4		Hold it there, continuing the "R" for a moment.
			Move 6 motors simultaneously to speak "EE"
Tongue	0	10	Tongue to the front of the mouth again, slowly.
Lip	48	7	lips wide open.
Teeth	18	7	Teeth half open.
Tip	15	7	Lower tip of tongue slightly.
Pitch	32	6	Raise the pitch.
Voice	18	10	Close the voice valve down to half open, slowly.
Tip	16	20	Raise tip of the tongue, very slowly, narrowing the "EE."
Wait	8		Hold it like that for a short time.
Voice	0	10	Close the voice valve, slowly. End of "EE"
			Move 2 motors simultaneously to close mouth
Lips	0	10	Close lips, slowly.
Teeth	0	10	Close teeth, slowly.
			It's not essential to close the mouth, but it looks more natural.
Clear_screen			Remove the word "THREE" from the display.
			All done. Duration: 1.2 seconds.

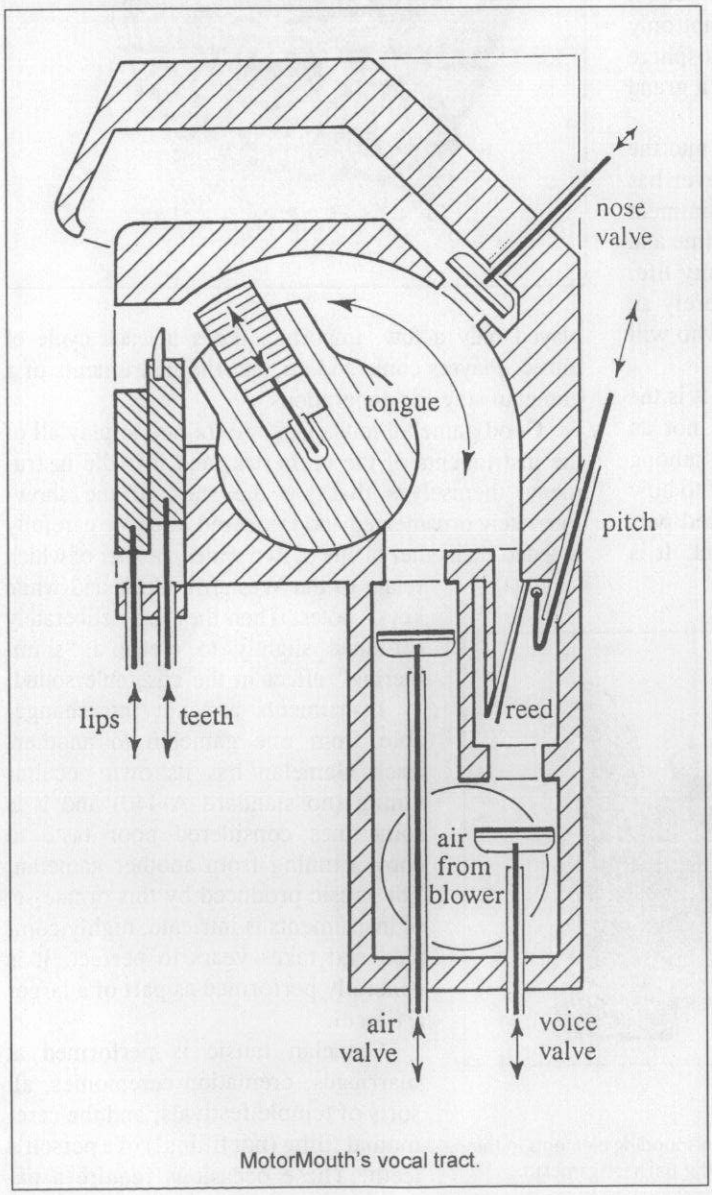
organs will take short cuts where they can. It would be possible to develop a comprehensive phonetically-based program to follow this rule but this would require some additional research and a considerable programming effort.

My immediate goal is to provide an interesting set of twelve programs — one for each button on MotorMouth's keypad. These programs will include counting, rhythmical speech, singing the vowel sounds, and a demonstration of the machine's other capabilities. When all the programs are completed I will place them in MotorMouth's permanent memory, disconnect my personal computer and MotorMouth will operate by itself. As you can see from the program, MotorMouth has a small display to tell the public which buttons to press and what they can expect to hear.

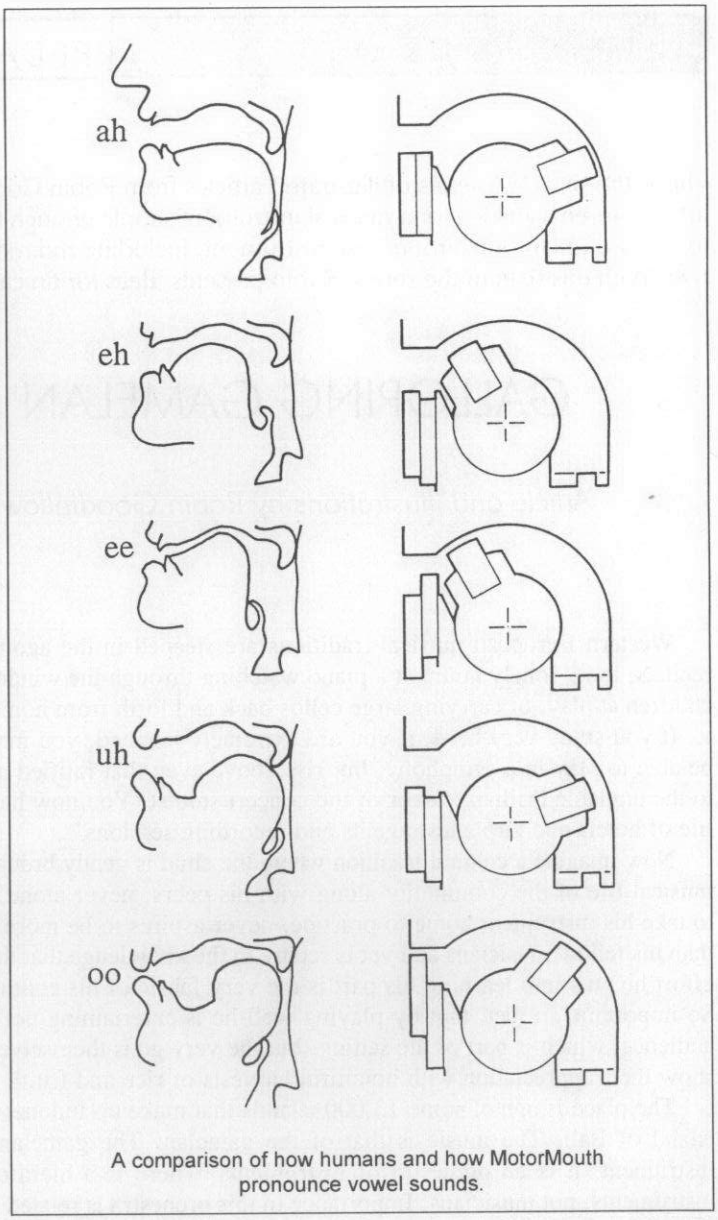
THANKS

The development of MotorMouth was made possible by a grant for materials from Berlin's Administration for Science, Research and Culture. The project has been much enhanced by the skills of Michael Buchmann, who machined the tongue and its base plate to air-tight tolerances, and Dipl.Ing. Gottfried Müller who designed the interface which connects the computer to the sensors, keyboard and motors.

MotorMouth is due for completion in the spring of 1999 when it will join the collection of the Berlinische Galerie, Museum for Art, Photography and Architecture, Berlin.



MotorMouth's vocal tract.



A comparison of how humans and how MotorMouth pronounce vowel sounds.

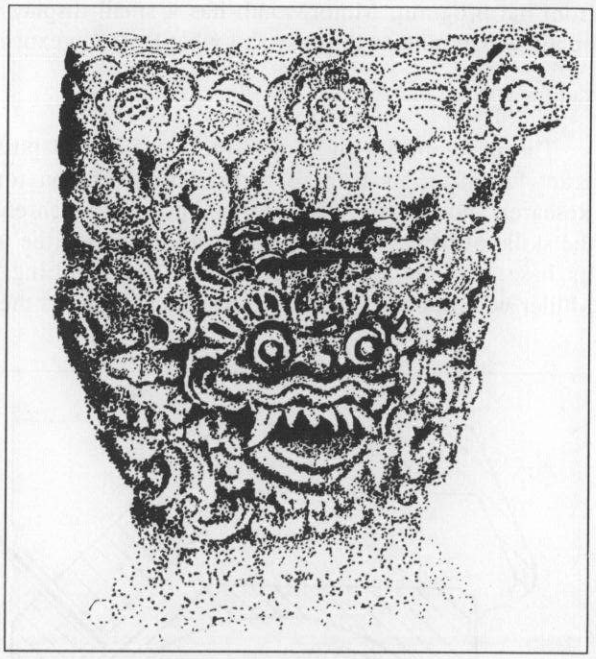
Born on the Isle of Wight, England, in 1942, Martin Riches studied at the Architectural Association in London and practiced architecture until 1978. Since then he has worked exclusively as an artist. Since 1975 he has built a series of machines which emulate fundamental human activities: walking, drawing, writing, talking, and making music; also Sound Sculptures and Sound Installations. His Music Machines have inspired many composers to write for them. He lives and works in Berlin.

Martin Riches can be reached at Steifensandstrasse 9, D-14057 Berlin, Germany; tel/fax (030) 321 43 13; email c/o Yumiko Urae, 101347.3305@compuserve.com

This is the sixth in a series of illustrated articles from Robin Goodfellow now appearing in *Experimental Musical Instruments*. Each article presents an idea for a musical instrument simple enough to be made by children. In addition, each contains the raw material for a lesson plan built around the instrument, including rudimentary principles of sound, elements of cultural lore, and a song or two. With this sixth in the series, Robin presents ideas for tin can percussion.

GALLOPING GAMELAN

Article and illustrations by Robin Goodfellow



Western European musical traditions are steeped in the agonies of first recitals, long, lonely hours at a piano watching through the window at other children at play, or carrying large cellos back and forth from home to school ... If you study very hard, if you are extremely talented, you may not only be able to play in a symphony, but rise above even that ratified atmosphere to the enviable brilliant career of the concert soloist. You now have a grand life of hotels and airplanes, agents and recording sessions.

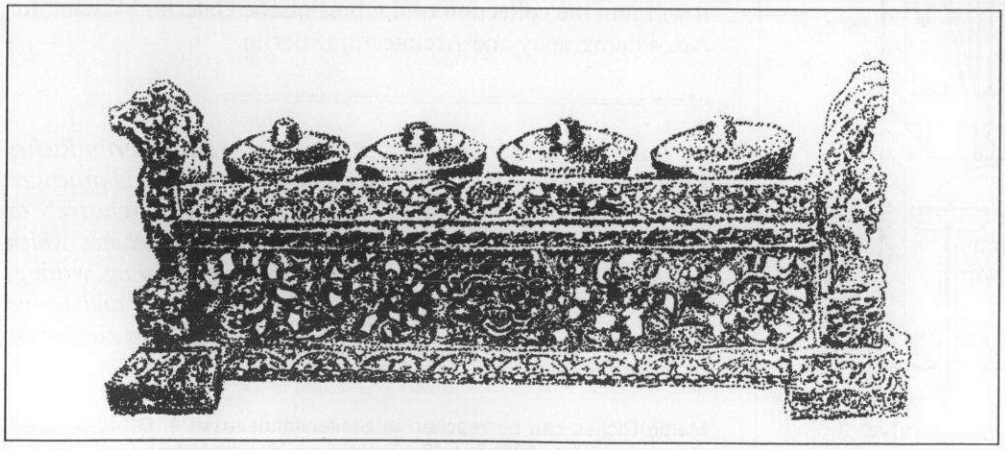
Now imagine a cultural tradition where the child is gently brought into the musical life of the community along with his peers, never alone, never has to take his instrument home to practice, never aspires to be more prominent than his fellow musicians and yet is secure in the knowledge that the time and effort he puts into learning his part is the very fabric of his community life. So important, in fact, that by playing well he is entertaining not merely an audience, which is part of the setting, but the very gods themselves who will show their appreciation with bountiful harvests of rice and fruit!

The place is one of some 13,000 islands that make up Indonesia. It is the island of Bali. The music is that of the gamelan. The gamelan is not an instrument, it is an orchestra of instruments. There is a hierarchy among instruments, not musicians. Importance in this orchestra is related not to how fast the notes go by, but how slowly!! This is an ensemble of glorified pots and pans in which a great bass gong is the most revered instrument. It is played only a few, important times in each cycle of music. Players come and go, but the instruments of a gamelan stay for generations.

Good gamelan musicians are trained to play all of the instruments of the orchestra, and it is the instruments themselves that are the stars of the show. Intricately ornamented and lacquered, they are carefully tuned to each other in one of two scales, neither of which relate to the Western "black and white keys" notes. Then they are deliberately off-tuned slightly to create a "shimmering" effect in the ensemble sound.

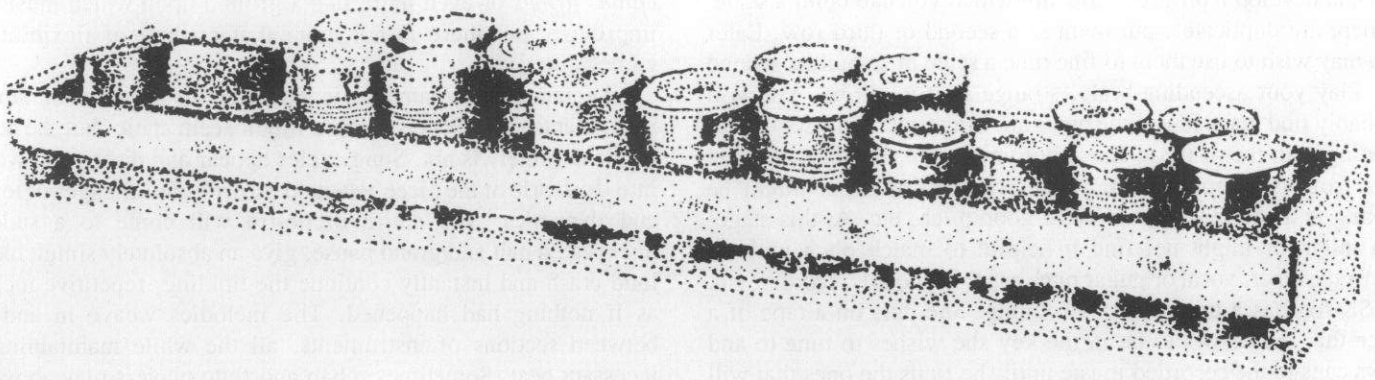
Instruments are not interchangeable from one gamelan to another. Each Gamelan has its own peculiar tuning (no standard A-440) and it is sometimes considered poor taste to copy a tuning from another gamelan. The music produced by this ornate set of instruments is intricate, highly complex and takes years to perfect. It is generally performed as part of a larger art form.

Gamelan music is performed at marriages, cremation ceremonies, all sorts of temple festivals, and the ceremonial filing (not filling!) of a person's teeth! These occasions require a pa-



ILLUSTRATIONS THIS PAGE

Upper right: Detail of typical decorative style for the wooden frames supporting the sounding elements in the gamelan instruments. Lower left: Reong, one of the tuned gong-chime sets of the Balinese gamelan.



Sharon Anway's "concert set"

rade to the temple, in which the members of the village carry on their heads great mountains of colorful fruits as offerings to the appropriate gods of rice, rain, and other important things. The feasting and community chatter that follow the inner temple religious solemnities are accompanied by the continuous gamelan music, which might also play for dancing, or an all night performance of the famous puppet shows.

The puppets are cut and punched from donkey hide. The strong, stiff, paper-like material is painted and decoratively punched. The pieces are articulated, or jointed, and attached to slender sticks or heavy wire so that they can move an arm and perhaps a mouth. They are set up behind a screen of translucent cloth with a light behind them, creating colorful shadows that tell the story of the Ramayana or the Mahabarata with sly topical inferences and local jokes spicing up the centuries-old stories that codify Balinese values and traditions from generation to generation.

People watch the show, listen to the music, eat of the feast, chat with their neighbors, watch the older children take care of the younger ones and all of this at once! The whole culture is a blend of many original and foreign influences, chief among them Hinduism and Buddhism.

A gamelan is usually a community instrument, all the pieces kept together for community rehearsal and performance. The individual gongs are treated with great respect. They are never stepped over and incense is offered to them before each performance, accompanied by flower petals and rice.

From floating with the sublime celestial sounds that intrigued such diverse personages as Sir Francis Drake, Claude Debussy and Lou Harrison, we land with a thud on the ubiquitous, if not ridiculous tin can. The transformation of this material into an instrument is the essence of simplicity.

In all my years of studying instruments; in all my previous work with tin cans as drum barrels and guiros, why I had not discovered this on my own, I do not know. Carolyn Hildebrandt, who helped me write my first set of books on instruments, called me one day in an excited tone and told me about her friend Sharon Anway, from Cedar Falls, Iowa. Sharon had taken a tin can, turned it upside down and beat upon it with a chopstick. That's all there is to it. Well, actually, that's not quite all there is to it. In order to play songs as unlikely as Offenbach's "Can Can" and "The Mexican Hat Dance" like Sharon does, you need several things: an awful lot of tin cans of all sizes to choose from, something to set them on, something to strike them with and a method of choosing which ones will create the scale you want. This might be the simple Western diatonic we are all familiar with (the white keys on a piano), or a chromatic scale (the white and the black keys). You might also choose an exotic scale from another music system or make one up as you go along.

Supposing you want to start with a simple ordinary white key scale. Think of the first three notes of "Mary Had a Little Lamb" or "Hot Cross Buns." Find three cans that approximate that relationship. If they sound like they will play both of these test phrases, you are in business.

Beware. Tin cans are tricky to hear. Some of them seem to sound high on one hearing and low on another. Sometimes the little cans sound low and the big ones high. This is partly because tin cans, like gongs and bells, have rich overtones, not necessarily in the same series that we are accustomed to in wind and stringed instruments. Also, different people hear things differently. People from different cultures hear the same notes differently.

Sharon uses cans with rounded bottoms for a loud, ringing sound that works well in outdoor performances. I like regular "tin" cans, especially tiny tomato sauce cans played with cheap wooden chopsticks. Sharon gets a more brilliant tone with round wooden chopsticks with metal tips. She puts a couple of inches of a plastic straw on the other end to improve the balance and also uses that end for a different sound effect. The sound from the split-apart kind of chopsticks is mellow and suitable for playing indoors with recorders and soft instruments. They are also inexpensive, even for a large group.

One way to get started with cans is to simply choose one relatively high can and one relatively low can. Call the low one "um" and the high one "papa." Play the low one once (um) and the high one twice (papa) and keep up this steady one, two, three rhythm. You have now created an ostinato, or repeated rhythm. Now sing or play some song such as "Have You Ever Seen a Lassie," or "My Hat, It Has Three Corners," "Over the Waves," or any waltz will do. You are now using the cans as an accompaniment.

If you wish to use the cans as a melody instrument, then they will need some sort of organizational tuning. One way to do this is to take all available cans and put them in a line, the lower ones to the left, the higher to the right. Don't try to make a scale yet, just bunch them roughly in groups of high, medium and low.

Now take two cans and see which one is the highest of the two. Put it on the right and the other to its left. Now pick up

another can. Is it higher or lower than the first two, or does it play in between them? Pick up another and another. In this way you can develop a progression from which you can build a scale. If there are duplicates, put them in a second or third row. Later you may wish to use them to fine tune a scale or to build a second set. Play your ascending scale, strange as it might be. You will probably find that a few of the notes are in a proper scale sequence. Starting with them, try to finish out your scale, scrounging extra cans from neighbors, eating some strange thing that might be lurking in a can that might have a good pitch, etc. At this stage, you might or might not find it helpful to match pitch with an electronic tuner, vocal or guitar pitch-pipe, keyboard, recorder, etc.

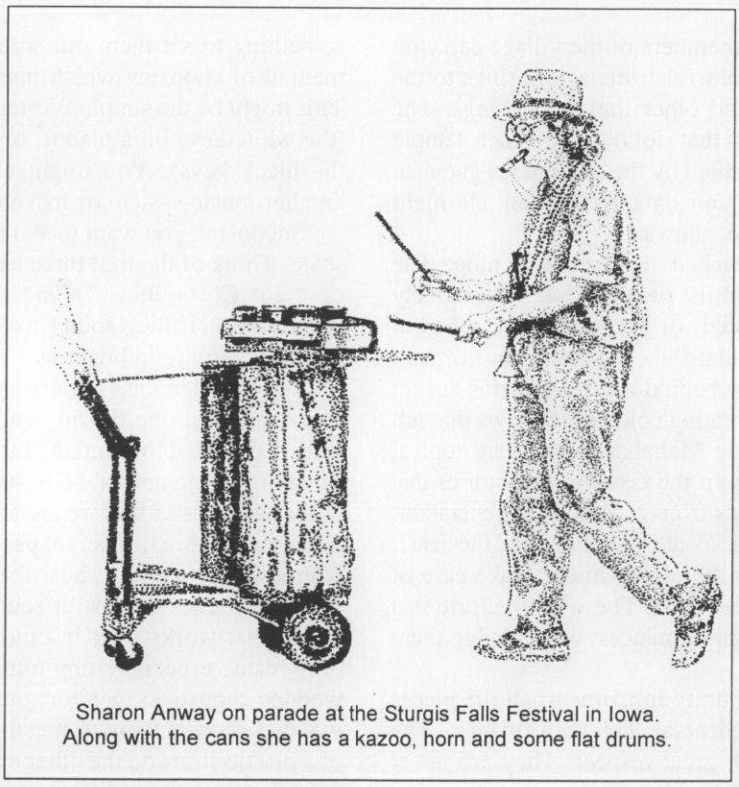
Sharon has a unique way of tuning. She puts on a tape of a piece that she knows to be in the key she wishes to tune to and plays cans to the recorded music until she finds the ones that will work for the harmonies of the song. She then plays the resulting scale or fills out the resulting tone groups into a scale. Sharon has a set of cans nearly two octaves high and fully chromatic with a few extra low notes. She writes the name of each note on the bottom of the can so that she can set up easily anywhere.

Cans play differently when placed on different surfaces. When I first tried to make a can sound, I placed it on a Formica counter top. Not much to get excited about. Then I put the cans in a cardboard box and I realized what the instrument could do. For large groups of children, I provide a piece of chipboard for each child. Sharon uses various types of plastic netting that allow the cans to be in contact with any surface as little as possible, and adds risers made of egg cartons to the smaller tuna and cat food cans so that they are the same height as the others for accurate playing. This is very important for Sharon, as she places her cans in a wooden trough made especially for them, adds wheels and a pulling bar and enters the Sturgis Falls Festival Parade playing Offenbach's "Can-Can" while a child pulls the contraption and a costumed crew dance a can-can to the tin-can-arimba all the way to first prize!

When Sharon plays her tin-can-arimba, it is like playing a marimba; she is the soloist, she owns her own instrument and she practices diligently to achieve musical and technical perfection. This is one wonderful way to play cans. A good way to start is to tune three cans, play three note songs and add cans as you need notes for more songs.

The galloping gamelan way to play the cans is to play as a group. In Bali, a whole section of instruments plays together, swapping notes with each other with astonishing rapidity. The higher notes embellish the melody, which, in some cases, is not played by any of the instruments, but is so well known by all the musicians that they can think it together in their heads and make appropriate melodic divergences, all of which will go together because they are all based on the same foundation, much like a *cantus firmus* or even more like a ground upon which musicians improvise, but there is not quite that amount of flexibility in gamelan music.

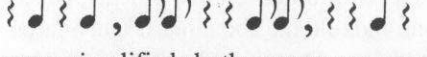
An Indonesian gamelan is arranged in sections of similar instruments. The basic structure might seem static, but the actual music definitely is not. Song cycles appear and disappear, woven into the fabric of the piece accented by drum-led changes of tempo and dynamics. The entire orchestra will come to a sudden, unexpected halt and grand pause, give an absolutely simultaneous loud crash and instantly continue the tinkling, repetitive melody as if nothing had happened. The melodies weave in and out between sections of instruments, all the while maintaining an incessant beat. Sometimes rebab and flute players play above all this with long, sustained phrases accomplished in the flute by the difficult practice of circular breathing, by which the player appears to never, ever, stop for breath!



Sharon Anway on parade at the Sturgis Falls Festival in Iowa. Along with the cans she has a kazoo, horn and some flat drums.

Back to the galloping tin-can-a-gamelan. To get the idea of a melody switching from person to person (as in early music hocketing,) take three tuned tin cans and three people. Assign each person to a can and play "Merrily We Roll Along" with each person playing their own note in turn. (Handbell choirs operate this way.) If you have tuned a greater number of cans you can have more people play. If you have tuned several sets of cans in unison (no mean trick!) you can have several players per set and play intricate melodies, counter melodies, harmonies and obligatos above and below the melodies. If all this sounds too complicated, just take a large drum to keep a beat and let everybody come in with a simple repeated rhythm in time to the drum, leaving rests where other people can fill in with their own combination of notes and rests. For instance, if the drum is beating quarter notes, some rhythms that would go with it would be

 repeated over and over to create an ostinato to which more layers may be added on other instruments:

 ...etc. More complex or more simplified rhythms may emerge. In other words, JAM!

Add some seasoning to your ensemble with drums, pluckers, scrapers and tooters. Slide whistles, triangles, finger cymbals are good. If you're starting from scratch, check previous *EMI* articles for instruments you can make from recycled materials. Some very simple ones from my articles are: "Balloon Boom," (*EMI* Volume

13 #1), "Scrappy Scrapers" (*EMI* Volume 13 #2), "From Flutes to Nuts" (*EMI* Volume 13 #3), "Plicker Pluckers" (*EMI* Volume 13 #4) and "Mellow Lamellaphones" (*EMI* Volume 14 #1).

Explore, create something completely different with your galloping gamelan!

Below are some pieces to play on your galloping gamelan. In addition, there are many books available for instruments such as recorder and tonnette that contain simple three-note pieces for beginners.

For further information on gamelan music in general, see the following:

Mantle Hood: *The Nuclear Theme determinant of Patet in Javanese Music* (Da Capo Press NY 1977; reprint of 1954 edition). This book is for a person who seriously desires to authentically tune and thoroughly understand the basic structure of Javanese gamelan music.

Judith Becker: *Traditional Music in Modern Java: Gamelan in a Changing Society* (The University Press of Hawaii Honolulu, Hawaii, 1980)

Stanley Sadie, ed: *The New Grove Dictionary of Musical Instruments*, entry under "Gamelan" by Margaret Kartomi (Macmillan Press Limited, London 1984).

Neil Sorrell A Guide to the Gamelan (Faber and Faber Limited, London 1990).

Michael Tenzer: *Balinese Music*

For general gamelan information and performances, check the following websites:

http://www.indo.com/culture/people. html

http://www.jags.co.uk/metalworks/pages/what_is_gamelan.html

http://www.lumina.net/gamelan_composer/quick_gamelan_intro.h tml

http://goarchi. com/archo/mag/frog.html

http://www.pacificnet.net/gamelan/story.html

http://www.indo.com/culture/barong.html

http://www.citysearch7.com/E/V/SFOCA/0010/51/05/

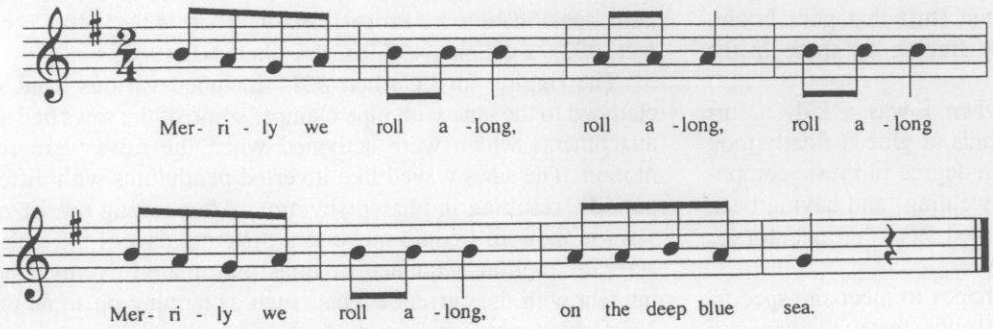
http:www.prica.org/indonesia/general/history.html

http://www.gsj.com (Gamelan Sekar Jaya)

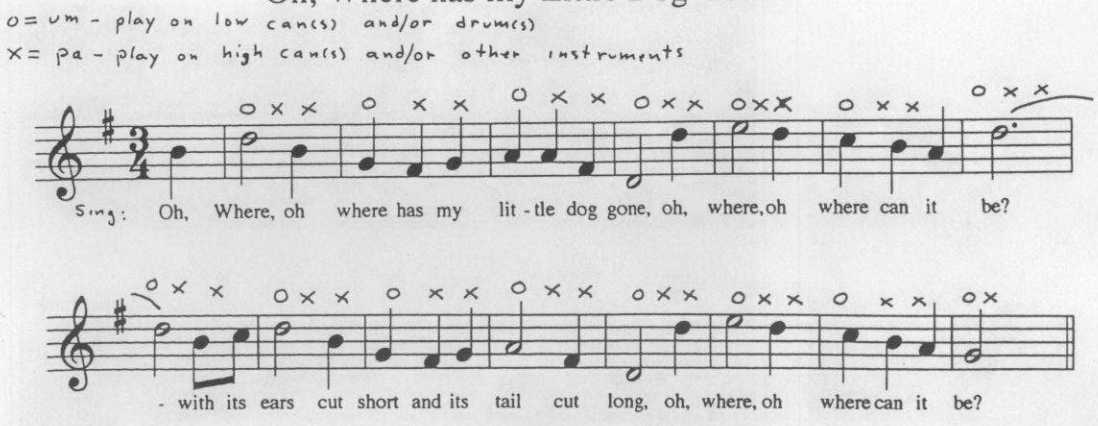
http://www.shadowlight.com

Thanks to Mark Salvatore of Gamelan Sekar Jaya for his suggestions and assistance with the portions of this article dealing with Indonesian gamelan, and to Dee Nitecki who took the photographs from which some of the drawings were made.

Merrily We Roll Along



Oh, Where has my Little Dog Gone?



Simple songs for performance with the cans. "Merrily We Roll Along" can be played with just three cans; it's also a good song for tuning. "Where Has My Little Dog Gone" can be sung to an *um pa pa* accompaniment played on the cans.

Robin Goodfellow is the director of Mandala Flute-works, a studio of music and art in Oakland, CA. She has been teaching children and adults for many years, and plays flute, piccolo and tin whistle among other instruments. She is the founder of the Queen's Ha'Penny Consort, a recorder and early instrument group that specializes in the performance of Renaissance music.

Robin draws from her extensive collection of musical instruments to provide illustrations and articles for EMI, where she has been a regular contributor for eleven years. She is developing a set of notecards featuring her drawings of instruments, most of which have appeared on the pages of EMI.

Robin can be reached at 1655 Vista Street, Oakland CA 94602, by phone at (510) 530-7835 or by email at robingoodfellow@earthling.net

She would appreciate information about stories and legends of instruments, and ideas readers may have for simple instruments suitable for children to make and play.

TANK MUSIC

By Reed Maxson

My closest neighbor lived half a mile away and probably was not even at home when I was playing a 55-gallon steel drum, at the age of about four, and my mother came out of the house and told me not to bang so loud, it would disturb the neighbor. I wish I had a recording of that session, it must have been most impressive. Now I'm 53 and wonder if my hearing might have been damaged by that drumming. I don't think so; my performance was cut short in the development section, certainly prior to the recapitulation. To my mother, the whole thing probably sounded like recapitulation, and she used the neighbor as an excuse to tell me to stop banging.

The session ended, but I did not lose my interest in that sound, that oil drum sound, that full resonance from a steel drum which could well have had herbicide or pesticide remnants in it, or explosive, toxic fumes. These days, teen kids would have 55 gallon oil drums in the back seats of their cars for that awesome sound, except they now have electronic stuff that goes boom, BOOM, baboom-boom-BOOM, thereby freeing up space in the back seats.

I didn't intend to break things when I was a kid, it just happened, and I never had the right kinds of glue. I finally took up welding. Eventually, after earning a degree in music composition, I naturally pursued a career in welding, and having been blessed with an energy-crisis, I fabricated steel thermal storage tanks for energy efficient, solar homes.

The tanks were custom sizes and shapes to meet site specifications, the "typical tank" being, say, 70 cubic feet with a capacity of 524 gallons, fabricated from 10-gauge steel. Compared to the 55 gallon drums, these tanks had grown in VOLUME and resonance, would not fit in any back seat, and I built more than 200 of them.

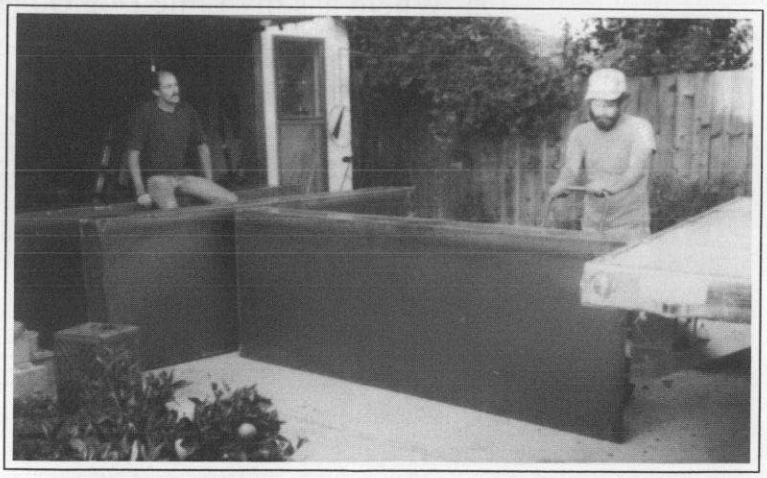
Occasionally, a tank would be stored in my shop for a day or two prior to installation and, occasionally, I would experiment with its sonic attributes and record the results. There were many possibilities for different sorts of tank music, so I made some rules: only items in the shop could be used for the sonic production, the "rigging" (i.e., attachments and tank preparations) had to be changed with each piece, and the piece had to be realized in one pass (no overdubbing). These rules were not quite as rigorous as those governing invertible counterpoint, for example, but served to narrow the scope a bit.

The recordings were made on a four-channel machine. Four mics could be placed variously, always including one inside the tank. The recordings and the mixes to two channels were "dry," as plenty of "reverb" was recorded naturally, inside the tank.

Each piece of tank music was identified with the client who ordered the tank. For instance, the piece called "Corbett #21" was not the 21st piece done on Corbett's tank. Rather, it was a piece using the 21st tank that Corbett ordered. I sometimes also included a modifying title or subtitle, and included some of the tank specifications: "Processional/Corbett #21," 40.47 cubic feet, 302.73 gallons, 497 lbs. dry, Jan. 10, 1980.

The rigging for "Corbett #21" included various hand saws clamped to the tank with pipe clamps; some of the saws had sonic attachments which were activated when the saws were set in motion. The saws waved like inverted pendulums with different periods, resulting in phased rhythms. After setting one or more saws in motion, I could move to a different part of the tank and activate another sequence of quasi-automated events, and/or interact with the current events, such as tapping on some of the 2x4s which were used for support during the tank's fabrication.

Some of the riggings included ¼" or 3/8" nylon rope strung around a tank and tightened with a 2000 lb. winch, using the 2x4s



Reed Maxon (sitting on tank above) and contractor Denny Long with steel thermal storage tanks

as bridges. I once played upright bass; this rigging was downright bass, compared to which, the baBoom-Boom boys have nothing but empty space in their back seats.

This music had to be choreographed, or was choreographed by default. Because the riggings were temporary, they were never refined to be user-friendly. One had to move swiftly and carefully around protruding clamp ends, moving saws, delicate recording equipment, etc. The performance art possibilities of this music was undeniable to me then. Ballet dancers, who were on temporary leaves of absence due to their often-suffered foot injuries, could have performed TANK MUSIC. Their costumes would have included steel-toed boots, hard hats, and OSHA-approved leather tutus. Now, with the decline of the National Endowment for the Arts, this work will no doubt remain virtual performance art, as, perhaps, it well should.

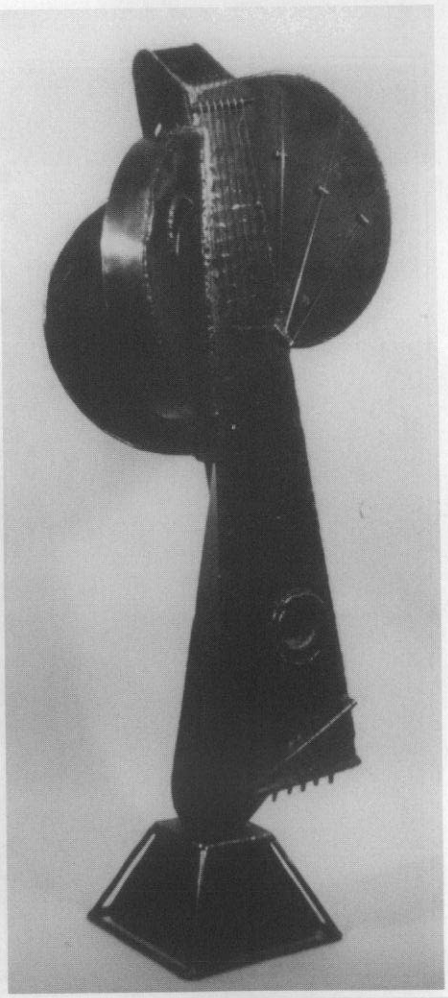
A fourth-generation Californian, Reed Maxson composes, teaches and performs music, and designs and builds sculpture in Davis, California.

TRIBO MUSIC

Some of the playing techniques used for *Tank Music* were derived from those used for *Tribo Music*.

I originally designed The *Tribo* ("try'bo," 45" x 19" x 12", welded steel) for *Please Touch*, a sculpture exhibit beheld by visually impaired gallery visitors, or anyone wanting to perceive sculpture through the sense of touch. In addition to its shapes, textures and temperature, the *Tribo* had the sonic attributes of an extremely resonant string and percussion instrument.

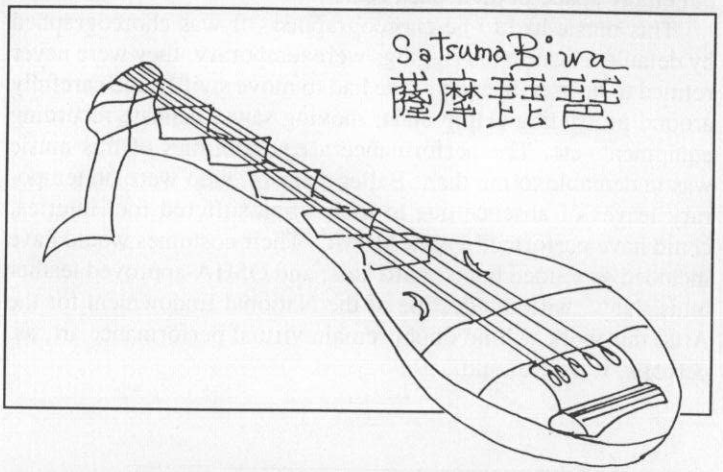
Following the exhibit, I developed playing methods for the *Tribo*, including the invention of many sculptural attachments which were motion sensitive, allowing one player to create rather complex textures by using these quasi-automated devices. The *Tribo* was also played by two to three players simultaneously, and in duo with a double bass.



Tribo, front and back views →

HYPERBIWA

by Jhon Miura Hardy

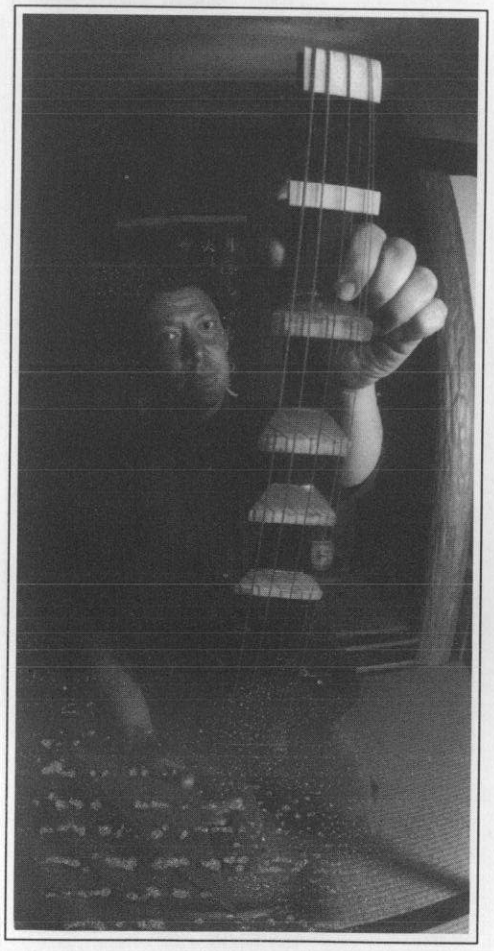


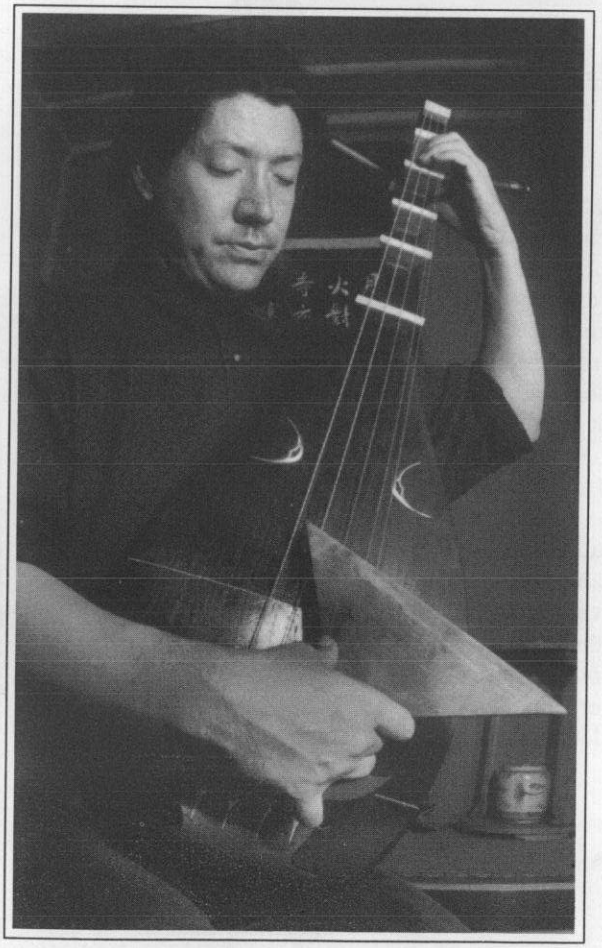
BIWA: SHORT HISTORY

The *biwa* is an east Asian pear-shaped bent-necked flat lute. It has a long history in Japan going back over 1300 years. The instrument was first brought to Japan from the sixth to the ninth centuries. It was used in the gagaku court orchestra. This form of the biwa is called *gaku biwa*.

Another form of biwa that entered at this time was the *mosobiwa* or blind monk biwa because it was played by wandering blind monks who helped to propagate Buddhist culture to the masses all over Japan. These monks forever tied biwa to Buddhist traditions and made the biwa a known instrument the common people could recognize.

The gaka biwa on the other hand is known only to the aristocratic families that played in the court orchestra. The two types of biwa differ in size and shape, type of wood used and playing style. Since the moso monks had to travel (wander freely) their biwa had to be small, slim and light to carry. Common, cheap and plentiful woods were used in its construction and a free attitude was held as to the tone the biwa produced. The gaku biwa, on the other hand, was played seated. It was a very large, wide, heavy and expensive instrument. Very luxurious, sonorous woods that came from south Asia and India were used in its construction. Its tone was of high aesthetic importance.





Variations of these types of biwa existed until a new type of biwa, the *satsuma biwa*, was developed in the 15th century in what is now Kagoshima Japan. The satsuma biwa was developed by very austere satsama samurai who built an instrument to exploit the vicissitudes of the warrior code (*bushido*). This new instrument was well made for the job. Though its roots come from the moso-biwa, the size and shape of the instrument grew, enabling it to produce longer sustain and a loud roar when played.

It was constructed of a very hard, almost mythical wood that grew deep in the forests that lined the mountain range at Kagoshima. The tree was called wild-mountain mulberry, a very slow growing tree. It took the tree a good

Far left: A close-up showing the itoguchi (flat nut), chu (large frets) and bachi (oversized plectrum) of the biwa.

Near left: Traditional biwa playing position. Photos by Steve Tracy

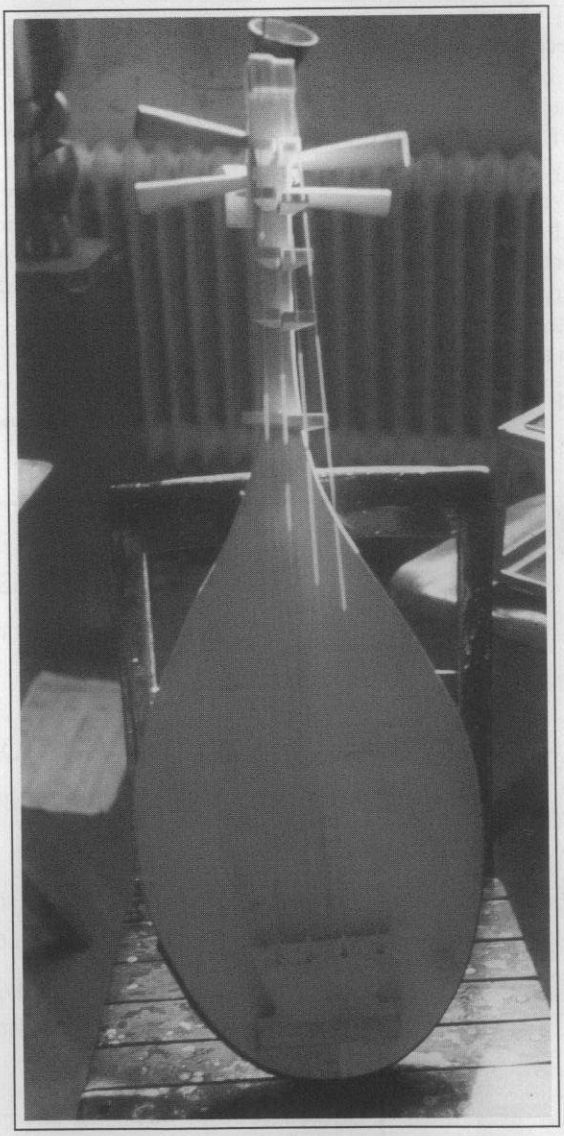
three hundred years to reach the size that a biwa could be made from its trunk. It was a great task to retrieve these trees from the deep mountain forests but it was well worth it, because the tone that biwas made from this wood produced could revive the most battle-weary samurai.

But there is another side to the satsama biwa. Two of the most important aspects of the satsama biwa are *on shoku* (tone color) and *ma* (space). Though the instrument is capable of quite loud heroic passages, you will find players often engaged in subtle modification of tone before it dies away. These gentle modifications of tone excite the biwa player enormously, as well as raise questions to our ever-changing earthly existence, a theme that stands at the center of the biwa player's desire to put forth the song of biwa.

Of course the main function of the biwa was to serve as accompaniment to the singing or chanting of the biwa player. The song contents of the *biwa uta* (or biwa song) deal mostly with the epic tale of Heike, an ancient book that tells the story of the decline of the Heike clan and in doing so explains the doctrine of Buddhism, especially the idea of *mujyo*. Simply put, mujyo is the ever-changing space-time continuum dimension that we all participate in while here on earth. Reminding everyone not to take their time here for granted is one of the jobs central to biwa.

Getting back to the instrument itself, it is simply constructed of (1) a hollowed-out pear-shaped body with (2) a thick top of 6 to 8 mm wood stem-shaped and glued on top. The type of wood used is the primary determining factor in the tone of the instrument, Japanese mulberry being the tone the satsama biwa players prefer. Sadly, today this wood is almost non-existent so alternatives are being sought.

Next to the wood, the *fukuju,* or bridge, is a determining factor for tone and volume. How the bridge and bridge pillar are connected to the body determines the volume of the instrument because the pillar transmits the string vibrations to the body, acting as a sort of amplifier of vibration. The strings of a biwa are made up of three strands of silk twisted with rice paste. Their tone lasts about 3 weeks. Silk string has a wonderful tone.



Hyperbiwa made from alpine spruce, tyrol maple and plastics, with metal springs.

At the top of the biwa , where the nut is on a guitar, a large block of ivory lies. It is called the *itoguchi*. The strings rest on top of this itoguchi, touching it. This creates a buzzing sound somewhat similar to some Indian instruments. We call this sound *sawari* — "to touch" in Japanese. It takes many years to learn how to control sawari on your biwa. Since the strings lie on top of the itoguchi, the itoguchi must be reshaped constantly to keep the sawari tone. This takes great skill. Each player develops his own special sawari tone.

The shaping of the sawari tone must be applied to the *chu*, or giant frets, as well. They are made from a softwood Honoki which must be constantly reshaped to keep its sawari tone. The chu determines the pitch, when a string is pressed down between two chu and a rolling action is done by the finger. The pitch system used by the biwa is subtle and micro-tonal.

The *bachi* is not part of the biwa, but plays an important role in determining tone color. The bachi is a large triangle-shaped plectrum used to play the biwa. Like a bow for a violin, a bachi for a biwa must be used many years before one is able to control the tone one makes with it. The bachi is able to produce many tone color and sound effects, examples being down strokes, upstrokes, scooping, striking strings and instrument, string clusters, sweeps, rubbing, tremolo, shaping of rhythm patterns and scratching. Japanese boxwood is mostly preferred but Japanese maple, camellia, holly, black persimmon and bontan are used.

HYPERBIWA

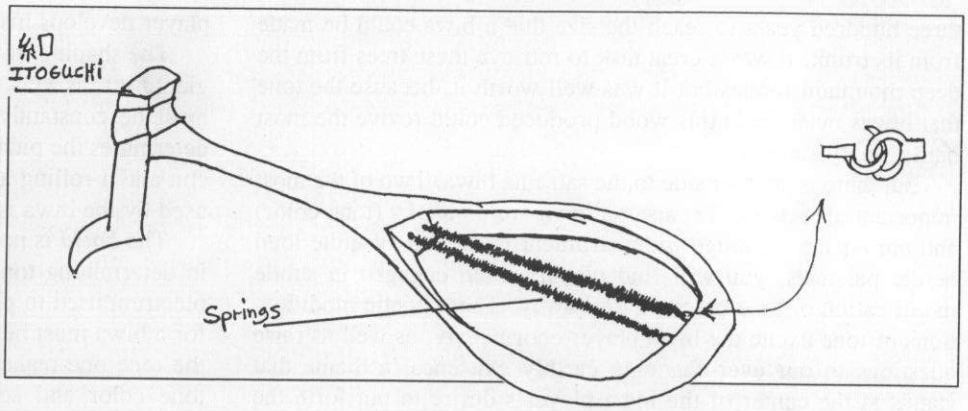
My main reason for building the *hyperbiwa* was to create an instrument that was capable to reflect my feelings of living in postwar modern Japan with all of its sounds, tastes, colors and smells, as well as being familiar enough to me that my years of classical Japanese music training could be used. Keeping with Japanese aesthetic, I wanted an instrument that was simple in design yet quite complex in tone color without the use of electronics.

Of course my main instrument, the satsama biwa, was simple in design and very variable in tone color, but the hardwood and silk string lute could not produce the metallic volume and sustain I was looking for to express the 20th century sounds I heard. My solution was the attachment of an inner resonating metal spring system that worked in sympathy with the silk strings. With the inner resonating system the biwa became more brash and louder, and had more sustain. The resonating springs amplified the small sounds one usually does not hear, creating a palette of new overtones and aftertone resonance.

In the past, Japanese musicians would draw inspiration from the sounds of animals, insects, bamboo brushing in the wind, the sound of the wind, the rain, the ocean and the human sounds, for example the sound of *Geta* (Japanese wood sandals). Today we still cherish these sounds but we must add to them the new sounds of modern Japan — motorbikes, cars, trucks, the bullet train, electronic sounds of games, computers and pachinko palours. This is our world now, so how can it be rejected?

The hyperbiwa is built to reflect this new world of ours, while

having a noble past as a base. The hyperbiwa is built in the same traditional way as a satsama biwa but with the inner sound chambers modified with spring resonators. Of course the use of springs adds sustain and a hyper-response to the touch of the silk string, but this can be overwhelming and a balance must be found depending on how much of a traditional or modern sound one wants. Simply put, the more spring the more effect. I have made a number of instruments with different numbers of springs. Each instrument has its own character which in turn affects my playing style. Having many springs creates long sustain and reverb, and long, simple passages that highlight tone color and space sound wonderful on this type of instrument.

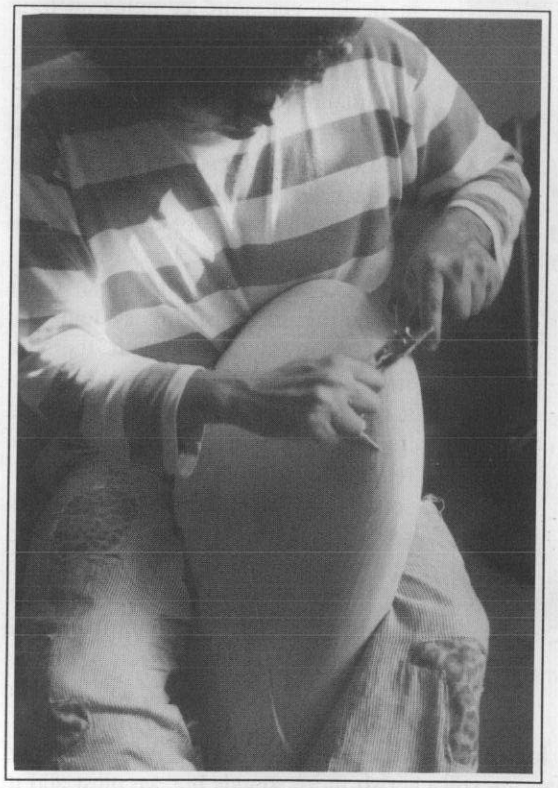


If I want to play a more traditional piece where I sing, having many springs creates a biwa that is too loud, overpowering my voice. So using a biwa with one spring is better, adding just enough to sustain to create a mysterious effect. The use of the springs also reacts well to the new concrete building that I play in now, as opposed to the wood and tatami rooms in which biwa was played before.

In conclusion, I would like to add that the hyperbiwa is not my idea alone, but a design based on reflection from seeing my *sensei* (teacher? guru?) playing with the sounds of a spring attached to a light, hearing a Chinese instrument with a steel wire attached inside for sound, and of course a burst of enthusiasm after reading this publication.

I think the spring resonator will work with any instrument...

Jhon Miura Hardy has played and studied biwa for sixteen years. He has also been building biwa for five years, and repairing them for ten. His main sensei was Tsuruta Kinshi, of whom he writes "She was one of the most important biwa players of the century... Segovia, Jiimi Hendrix and John Cage rolled into one very deep woman who blazed a trail in the world of biwa." Jhon now studies biwa with Tanaka Yukio and Kawano Torao. He has also studied koto, shakuhachi, and other Japanese instruments. Jhon is represented by Kougetsu Artist Management in Tokyo, and he can be reached at 2-7-13 Minami-cho, Kokubunji-shi, Tokyo, Japan 185-0021.



The author at work carving the body of a biwa

Here is the first half of a two-part article on the ins and outs of musical bamboo. Part two will follow in *EMI*'s coming issue.

BAMBOO AND MUSIC, Part 1

By Richard Waters

Bamboo and music are a natural. Blow it, strike it or pluck it — bamboo makes music. Few materials in the world can match bamboo for versatility, strength, beauty and sound qualities. Even the word "bamboo" is percussive. For musical instruments, sound devices and sonic sculptures bamboo has been used in wind, stringed and percussion instruments as well as those items that straddle categories like bullroarers, musical kites and bamboo Jew's harps.

In the last article I wrote for *EMI*[1] I covered information on growing, varieties, and dividing both clumping and spreading bamboos. This article will focus on application and design of instruments, and on some of the music and instruments from places like Bali, China, and Hawaii. Reference will be made to a few recommended bamboo species and to new information extracted from international research organizations and scientists who explore the various aspects of bamboo. Traditional information from third world bamboo countries coupled with the latest bamboo research from around the world will be briefly reviewed in this article. Some of the material presented here was developed from ongoing discussions on the Bamboonet[2] on the Internet, which is an international bamboo discussion group. I would also like to thank Dr. Walter Liese and Dr. Jules Janssen for their research assistance.

In discussing the utilization of bamboo for musical instruments, we will examine several areas.

(1) Matching the bamboo to the design, or "how does it sound?" The most important things to consider about selection are: (a) Dimensions — does the bamboo have thick or thin walls, long or short internodes, diameters and lengths that are suitable for your instrument design? (b) Are the culms hard or not? (c) Is this bamboo highly susceptible to Powder Post Beetles and other bugs/fungi? (d) Is it prone to cracking and checking?

(2) When and how to best cure and preserve bamboo with the least amount of effort and cost and toxicity.

(3) How to work bamboo: tools, methods, cautions.

(4) Protection and finishes.

(5) A few musical bamboo designs.

Bamboo and the culm wall: Generally speaking, thinner-walled varieties of bamboo are preferable over those with thick walls as they resonate to a wider range of frequencies, are lighter in weight, and easier to work.

Most bamboos have thicker walls closer to the ground that become thinner further away from the ground. Consider this variation when choosing a portion of the culm to work. If you are making a stringed instrument and want a neck that will bend the least when strung, then a base section of culm may be desirable, whereas if you are making a flute or stamping drums or a musical kite, perhaps a thinner-wall section further up the culm would be best.

There are exceptions. Some traditional designs like the shakuhachi (*Phyllostachys* genus) use the thicker base section where the culm attaches to the underground rhizome. Some percussion instruments, like bamboo tongue drums, take abuse, so are frequently made from thicker material to withstand the punishment of being repeatedly struck. The "form follows function" design principle could be expressed as "musical function follows bamboo species." This is closely defined in traditional bamboo art forms such as the making of shakuhachi. But for most designs there is a very wide range of suitable bamboos available.

Hardness varies but some of the hardest are in the *Bambusas Dendrocalamus*, *Guadua* and *Phyllostachys* genera (families) of bamboos. No survey is available for bamboo hardness but it is known for instance that Moso (a *Phyllostachys*) is between oak and cherry wood in hardness. This hardness is due to the high silica content, especially close to the surface (skin) of the bamboo.

The skin is so hard and strong that flat strings can be made from it by inserting a knife blade and slitting an elongated, small piece but leaving the ends still attached. Small pieces of bamboo are wedged under each end of this bamboo ribbon/string to act as a bridges. This Balinese instrument is struck like a percussive device and the bridges are movable so it is tunable to a degree. When making one of these consider binding the ends or clamping with large hose clamps to prevent the knife from severing the bamboo string from the culm section. Use one culm section with the two nodes intact. After separating a string, drill holes (apertures) under it so the sound can get in/out of the resonator or drill the holes where the instrument is held so that the fingers can control the aperture(s) for tone/volume changes.[3]

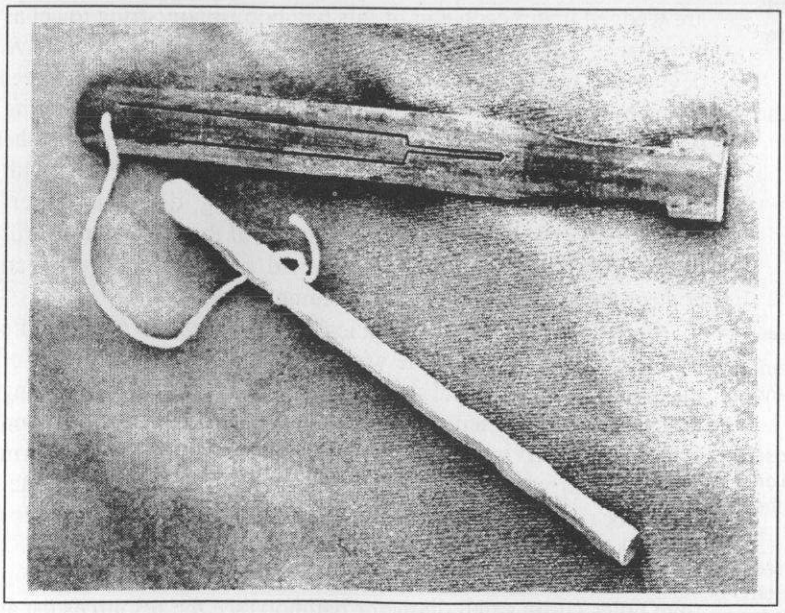
One early version of the ancient aeolian Chinese musical kite was made much in the same way by splitting away flat pieces of the culm to act as musical strings or ribbons. Sometimes the string was separated and then notched at the ends. A small culm section was also notched to receive the string. These two elements form a bow which was the basis for an ancient Chinese aeolian kite. Now silk ribbons are used as strings on a bamboo framework for musical kites in Asia.

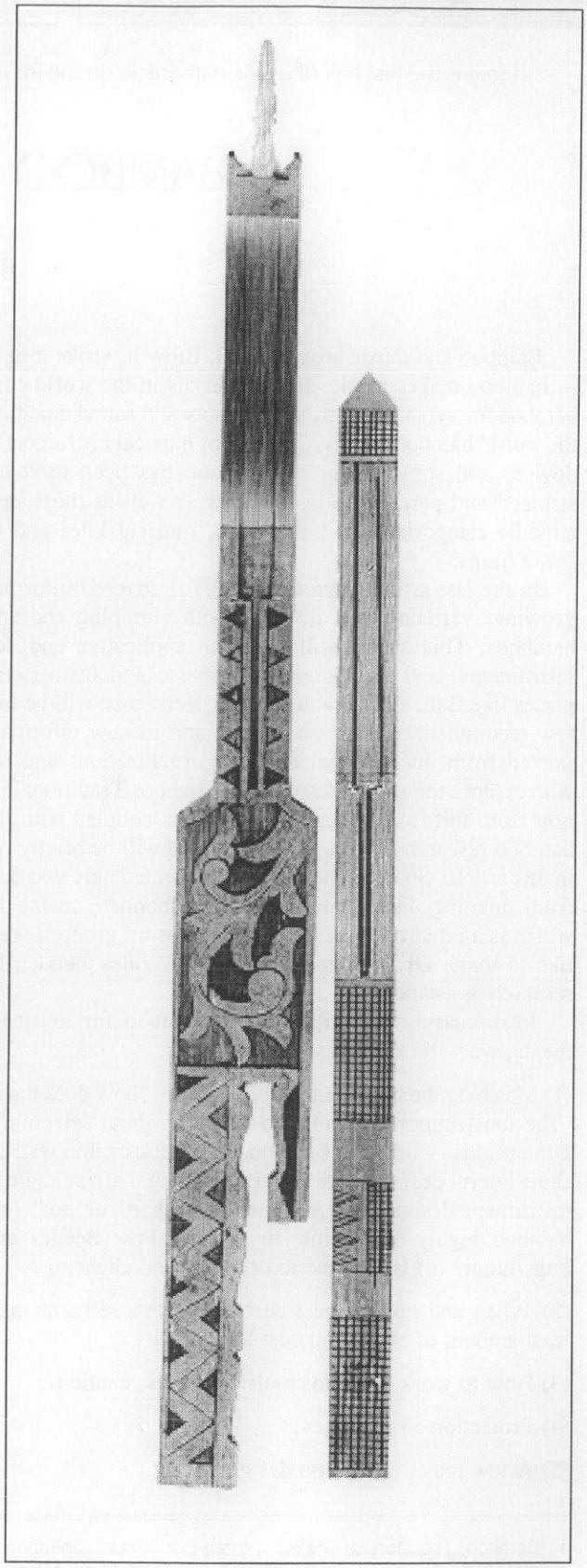
Another version of a musical kite is a wind flute aloft with flute holes cut in small diameter bamboo (see the resources list at

1. "Bamboo, The Musical Grass," a three-part article appearing in *Experimental Musical Instruments* Vol. 10 #3 & 4 and Vol. 11 #1; March, June and Sept 1995

2. I would like to thank those "Bambuseros" for their assistance. For those of you who would like to sign on to the bamboonet, if you will contact me on e-mail I will forward the instructions to sign on (see my e-mail address in the resources list at the end of this article).

3. For an article on similar instruments found in Africa and the Caribbean, see "The Bamboolin: A Jamaican Idiochord Zither / With Additional Notes on Idiochords" in *Experimental Musical Instruments* Volume IX #4, March 1994.





Photos 1A and 1B — Upper left, two photos: Bamboo wind instruments band at the 1995 international bamboo congress in Ubud, Bali. Photos courtesy of Hans Erken,

Photo #2 — Lower left: Genggong (Balinese bamboo Jew's harp). Photo courtesy of The Jew's Harp Pictorial Archive

Photo #3 — Right: Kubing (Philipine bamboo Jew's harps)

the end of part 2 of this article).

In 1995 the International Bamboo Congress was held in Ubud, Bali. The music presented in conjunction with the IBC was outstanding as villages from throughout Indonesia including Bali and surrounding islands had sent their best musical groups. There were three continual music stages for five days so it was impossible to take it all in, but one of the more impressive groups was the all-bamboo western-style orchestra, "Satria Jaya." This group is unique to North Sulawesi and has about 50 players, on such instruments as clarinets, saxophones, flutes, cornets and tubas — all made of bamboo, with exception of the drums. This orchestra wore regal uniforms and was led by a conductor. In their concert, Satria Jaya played many kinds of music, from traditional Manadonese to popular Indonesian and Mozart. The interiors of the horns looked to be painted with white plastic or latex. The instruments were amazing, as they had all been so carefully crafted by laminating strips of bamboo to make the exterior part of the wind instrument bells (compound curves) and most of the other parts (see photos #1A and 1B).

The hottest musical group that I heard — and there were many — was a quartet of bamboo flute, a drum and two bamboo Jew's harps of an unusual design. The end of the bamboo Jew's harp was attached to a string which the players yanked to activate the sound. These are Balinese bamboo Jew's harps known as *Genggong* (see photo #2). The rhythm/drone that the two Genggong players set up was backed by drum and topped by a flighty bamboo flute melody line. The overall sound was hypnotic, yet exciting, and intense. This group was known on the program as "Genggong" from Mundak, Bali.

Various forms of the Genggong, or string-activated Jew's harp, are found all over Asia under different names — *Selaesi* (Celebes) or the *Mookh-Kuri* (the traditional instrument of the Ainu people of Hokkaido Island, Japan), and others. There are other designs of bamboo Jew's harps that come from Thailand and the Philippines. These are known as *kubing* in the Philippines (see photo #3).

Although simple-looking, these Kubing and Genggong call for some skill in carving due to the precision required. The carving is a skilled craft with close attention paid to tolerances. Kubing are easy to play, and rhythms and melody lines can be played. With the changing of the mouth cavity shape and the breathing in and out while plucking with various types of strokes/times, the variations of sounds that can be produced from such a small device are amazing. Kubing are easy on the teeth as they are placed against the lips rather than the teeth as with metal Jew's harps. The Kubing has become one of my favorite instruments, as it is extremely easy to transport, it is inexpensive, and the sound reminds me a little of Didjeridu and/or Batutu (see sources).

The gamelan orchestras in Bali were excellent, with some bamboo instruments 3-4 meters (10-12 feet) long and bamboo diameters of 15-23 cm (6-9 inches) or more. The balance of bamboo against metal, and the precise rhythms, were very impressive and full sounding.

There were also many variations of bamboo xylophones and marimbas. Some had split culms for the bars while other had whole culms (see photos 4A and 4B).

While in Bali we were invited to join a celebration in a nearby town. There were to be some master bamboo flautists in a Hindu religious parade. Shortly after we arrived, village women placed large baskets of fruit on their heads. The marching band loosely formed and without as much as a countdown they hit the one beat and away we went. The two bamboo flautists and two double reed wind instrument players led the procession followed by a dozen or so metal/wood percussion players laying down a tight rhythm in an odd time. At the rear of the band were two huge gongs suspended on horizontal bamboo culms that four men carried while one person was in the middle laying down an alternating one beat playing both gongs. We followed behind while this enthusiastic marching band led our joyous procession to the temple which was about a half mile distant. What a rhythm section! As we approached the temple the women and fruit offerings went through the main entrance to the temple while the marching band and everybody else went through a gate in a stone wall. The music stopped when we were inside, and there we were in the middle of a large cockfight arena with maybe 250 people plus the band. Bets were placed and the cock fight began. I was told it was the only safe place to hold a cock fight without being arrested.

While in Bali I noticed that batutus (Devil Chasers) there are made with a slot instead of a hole in the handle. This slot allows for subtle tone changes depending on how it is held and how much covered/uncovered. A Batutu or Devil Chaser is a double-node section of bamboo with the top end open, the bottom end closed and the middle node knocked out (see photo #5). The bottom end is secured with cord and a split is started at the open, top end. The upper internode is then carved like two opposite blades which are the same length, shape, and sound. A slot is cut in the bottom internode (not on the split) so that the skin between your forefinger and thumb is used to cover part of all of the slot as the Batutu is played. A Batutu is held by the bottom internode (handle) while one of the blades is struck against the heel of your other hand. The buzzing sound is created by the crack that continues from the bottom of the upper internode down into the bottom internode. Dimensions can range from 1/2 inch to 2-3 inches in diameter (about 1-7cm) and 12-24 inches (300-600cm) long. Bamboos used for Batutus should have relatively thin walls. The slot that is cut in the lower internode handle is about 1/4 inch wide by 1 inch+ long. By repositioning the hand on the handle the slot can be more opened or more closed, thereby changing the tone. Batutus are powerful rhythm instruments.

In 1997 while attending the International Bamboo Workshop in Anji, China, I heard an outstanding bamboo pan pipe player. The pipes are arranged in an arc and are glued or epoxied together (see photo #6). The performer on these pan pipes could warble like a bird as he maintained a complex melody line. He received a standing ovation at the end of his performance from a packed concert hall.

The German preservation scientist, Dr. Walter Liese, presented a paper in China indicating that harvesting bamboo culms in the seven-year-old range will reduce the chances of cracking or checking. His electron microscope research was done on a *Phyllostachys* (*viridi glaucescens*) and the results might have been different for other genera or species, but seven-year-old culms would be a good target age to harvest for bamboo intended for most musical designs.

Dr. Liese's studies concluded that lateral strengthening was taking place in culms seven years old and perhaps older. When possible, try to select culms older than five and younger than ten years old. Optimum culm strength is between three and five years of age, but while maximum strength may not be needed for musical instruments, lateral strength is.

Monty Levenson of Tai Hei Shakuhachi indicates that, for shakuhachis, only Madake (P. *bambusoiodes*) culms of 3-6 years in age are selected for harvesting. He also indicates a large quantity of bamboo harvested for shakuhachis is lost to cracking.

How do you tell how old a bamboo culm is? By becoming a student of bamboo visuals. New culms are bright green and

Photo #4A and 4B — above: Bamboo xylophones, some made from split culms and some from whole culms. (Photos courtesy of Hans Erken)

Photo #5 — below left: Batutus

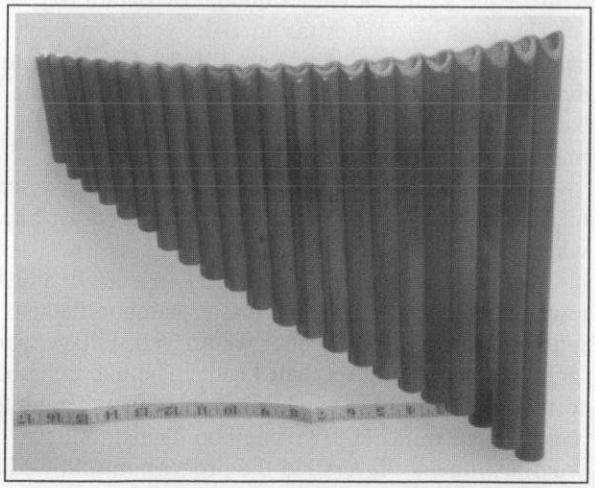
Photo #6 — below right: Bamboo pan pipes

unmarked with no dead or old-looking branches. The leaves are fresh and relatively untattered or burned. As the bamboo ages the culms become marked with age. Older culms will have changes in coloration, patterns and mosses — the marks of time. Older branches will be visible as well as dead branches. The leaves are tattered and sometimes scorched along the edges or tips. This will at least allow you to make an educated guess. If you can grow your own, marking the culms with the year they shot so as to know exactly when to harvest is a good idea. This marking procedure is now being done in the intensive Moso Groves in China so there is no guessing as to the age of a bamboo culm.

Culms under three years old are weaker and contain more water and starch, which makes them much more susceptible to bugs and fungi and to cracking and checking. For garden stakes they may be OK, but these are inferior bamboos for musical designs. As culms mature and pass their prime strength period they slowly begin to reduce starches, so that older culms are less likely to be attack by bugs.

Part two of this article, including an extensive resource list for bamboo music, will appear in *EMI*'s coming issue.

Richard Waters intertwines three areas in his work — art, bamboo, and music. For over thirty years he has been inventing, building, and performing on new kinds of musical instruments, sound devices and sonic sculptures, including his extraordinary water-and-metal instrument, the Waterphone. His work is exhibited widely in galleries, museums and music stores and he and his instruments are on numerous recordings and movie/tv sound tracks. While living in California, Richard also operated "A Bamboo Shoot" nursery, propagating & shipping bamboos worldwide. He has been active in the American Bamboo Society (ABS) for the past 15 years and has served on the National and Regional boards of directors as well as initiating the National ABS Arts/Crafts/Coordinator position. Richard can be contacted at his studio on the Puna Coast of the Big Island of Hawaii where he also grows more than a few varieties of bamboo.



CIRCUIT BENDING and LIVING INSTRUMENTS

THE SUB-CHANT GENERATOR

by D.R. Ghazala

While driving the gravel "truck routes" that span the remote inner regions of Michigan's Upper Peninsula, it's hard not to ponder the ranks of great tree stumps spread over the landscape: gray and ancient looking, cleanly severed long ago leaving legions of these wide pedestals fading into a sea of mere dots and disappearing into the texture of the horizon. Sand dunes have since encroached to surround these massive stumps whose table-sized platforms defiantly exclaim a lost majesty nearly impossible to picture within this created wasteland. The occasional oasis, beautiful as it may be, still only supports trees a fraction of the girth and splendor of their ancestors, the endless wooden tombstones now a silent testimony to the forest's previous life.

As I traverse these rough paths and my passengers stare out at the remains of this fallen forest, my words are always met with the same look of disbelief when I announce: "A cow did that". At this point I'm always tempted to remain silent amidst the confused faces, letting the enjoyable detective work of deciphering this surreal connection of facts take hold ...

THE SUB-CHANT GENERATOR

By Q.R. Ghazala

(continued from previous page)

After all, Chicago is but a float across Lake Michigan, the waterway that adjoins the shores of both northern Illinois and the southern Upper Peninsula or "U.P." as it's called. I'd like to think that Mrs. O'Leary's cow is merely the fall-bovine for the Great Fire that consumed this wood and piped-gas metropolis of 1871, since safe placement of lit lanterns must be left up to milkers rather than milkees. But what is indisputable is that Chicago was rebuilt, to a great extent, with the downing of the great forests of Michigan's U. P. Mystery solved.

Now then, what if we were discussing the spread of "western" musical notation and its influence around the world: the way it has shaped how we think about and compose music, how it is at the heart of so much musical art that we define, even distinguish ourselves through, and I were to then announce: "A dove did that."?

If we are to believe the recorded history of past times significant to the development of today's music, a history seriously put forth by the closest parties to the facts in question, then yes, we might owe our predominant musical thought and appreciation to a dove. A talking dove.

Tracing the roots of our written music takes us, inevitably, to the needs of the early European Church in standardizing services. This included the eventual charting of chants as typified by the evolved "Gregorian" melodies still in use today. While proposed timelines are not without conflict, traditional church lore has Pope Gregory I (r. 590-604) establishing an initial form of graphic notation in order to scribble down the chants sung into his ear by a messenger from God — a white dove perched upon his shoulder. These avian syllables, we're told, are the basis of what was to become known in the Pope's namesake as Gregorian chant, and perhaps prompted the creation of the staffed form of musical notation so well known today.

Woodcut of Chanting Dove and Pope Gregory I
(As reproduced in *Music* by Alan Blackwood, Mallard Press)

Of course, this all took place within a church struggling to deify its clergy in the eyes of the masses as well as counter the political subterfuge within its own ranks between the Pope's authority, as the Bishop of Rome, and the lesser powers of the other Bishops who found themselves questioning Gregory's presumption of "first among equals".

What *is* known is that much attributed to Gregory the Great was not proclaimed until later centuries. Pope Gregory is credited not only with amassing, organizing and writing the plainchant of his day, but also with establishing for the Church the *Schola Cantorum* school of singing in Rome, setting into practice the Church's yearly cycle of liturgical readings, and even sending missionaries out into the world in search of new musical styles to bring home for the further glorification of Pope, Church, and in the usual round-about way, God.

Regardless of the fact that the Gregorian chant known today has little in common with the plainchant of Gregory's time, now known as Old Roman, and rather owes its chief formation to the Franks' rejection and re-working of these Old Roman chants as brought to them by Charlemagne's decree two centuries after Gregory the Great's death, the Pope's name has successfully adhered. If cold history had its way, Gregorian chant might more properly be named Carolingian, the dynasty of Franks ruling France in this period around the year 800. And if I had my way, Gregorian chant would be named, as you've guessed, Dovinian. Fact or fiction, this notion is delightfully whimsical and gives that all-too-rare devotional nod of appreciation toward another of nature's own.

The sounds of Gregorian chant are based upon breath for length of phrase and the stress of language for accent. This assembly creates a non-metrical, free-verse rhythm more resembling prose than the measured music so much more prevalent today. While Gregorian, with its three-thousand documented chants at hand, is the best known of this singing style, many other forms of chant subscribe to these same naturalistic sensibilities.

Anglican chant, heard in the Church of England, is a widely-used harmonized chant of psalms and canticles. Ambrosian chant, after St Ambrose, is currently in use in Milan. Byzantine chant of the Eastern Orthodox rite, in the strict definition of plainchant, still often forbids the thought of any instrumental accompaniment whatsoever, harking back to the belief of musical instruments' evil role in the "Debauchery of Rome"; an event, I'm told, I should have attended.

As one continues to trace these chants backwards in history, the trail becomes less and less distinct as it leaves the Christian rituals and wanders off through the first city temples and into the earlier camps of the Arab and Jewish peoples. It is said that the Hebrew cantillation heard to this day, having been passed through the ages chiefly by means of vocalization and memory (though notations known as 'tropes' are still used as an intonation guide), affords us the best contemporary glimpse available into the ancient foundations of this pivotal music.

Outside the geographic boundaries of these vocalities lie other forms of perhaps even more mysterious chant. The North American Indian's supplications of chant served, once again, as a sacred connection with the Great Spirit. A body of short melodic phrases are combined and re-combined in the chanting style of the Buddhist shomo. And absolutely fascinating is the Tibetan chant-

ing of the Mongolian overtone singers, the dual tonality of fundamental and overtone representing the link between man and the Divine. Vocal representations of natural phenomena — wind, rain, animals — take the form of stylized utterances such as growls and hisses as they intersperse with the often stunningly-quick streams of multi-frequency syllables that create this spectacular chant.

Primal chant might be the catalyst of the voice, of spoken word and of song. Phoneme cycling, the repeated uttering of vowels and consonants, surely represents the very beginnings of organized language. In chant there seems to reside a primal power to draw both listeners and participants in, almost hypnotically, to its particular realm. Chant, in all of its differing forms, remains a specialized *sound and concept dance*, in certain ways minimalist in nature, though often acutely refined in meaning.

Where, then, in this universe of chant, where instruments often rank from rare to forbidden, do these two musical entities meet?

The reality is, as one might suspect, that outside of European plainchant as backed by its history of reactionary ecclesiastical politics, instrumental accompaniment to chant isn't so rare at all. There are numerous examples of rhythm instruments used to accompany an assortment of ethnic chants all around the world. Melodic instruments can also be found associated with chant, but notably less often. However, the very vocal nature of chant invites speculation as to what instruments might be used to extend the voice itself rather than simply supplement it. Two such instruments come quickly to mind.

There is an unusual 17th-c. instrument called the eunuch-flute. This is essentially an elaborate type of kazoo consisting of a long, decoratively-carved tube with a thin diaphragm fastened at one end. This membrane instrument, or *mirliton*, produces the complex nasal overtones familiar to the kazoo when the open end is sung into. And while not associated with chant *per se*, the didjeridu player's occasional vocal colorations as added to the trumpet-blown drones suggest a strange musical dialect somewhere between the two.

It would seem by now, considering both the pervasiveness of chant and the proclivity of voice synthesis technology, that electronic chant generators might have come about. The one I built, nearly fifteen years ago and the surprise focus of this article, was constructed with two notions in mind. First, I hoped to create a simple phoneme generator with which to explore musical possibilities within the elements of synthetic human speech. Additionally, I was inspired to try to unlock the uncharted audio possibilities of non-speech-oriented complex sounds capable of being produced by the differing sections of the voice synthesizer's audio circuitry. This latter consideration would be left up to circuit-bending's* unusual influences. Not only were both goals accomplished, but in the end a very strange world of subliminal chants arose, quite unexpected and by accident.

The Subliminal Chant Generator, also called the R. A. P. synthesizer (named long before rap music and standing for Readily Available Phonemes), is essentially two SPO256 integrated circuits (ICs) working in conjunction to create a stereo vocal output. Radio Shack was a major supplier of these no-longer-available ICs, offering them to electronic hobbyists during the mid-80s. These chips synthesize human speech by means of a method known as LPC, or Linear Predictive Coding. In order to grasp the functioning of the Subliminal Chant Generator a little bit of technical explanation is needed. For simplicity's sake I'll round off a few corners...

At the heart of this IC is a programmable digital filter acting upon a pitch source in such a way as to model a vocal tract. The results of this filtering are a set of 59 speech sounds known as allophones. Allophones might be considered "real-world phonemes" inasmuch as certain individual phonemes can actually vary in sound depending upon their position in different words. In combination with 5 micro-pauses of differing lengths, any word in the English language can be synthesized using this allophone set.

Each of these 64 different audio events (59 sounds and 5 pauses) are represented by a unique six-bit "address" within the chip. Picture six switches, like the light switches on your walls, all lined up in a row. Each switch can be flicked in either of two positions: on or off. Within the chip are similar switches, so to say, that register the same kind of on/off status when under the presence or absence of a small voltage. If the voltage is applied, the "bit" (switch) is said to be "high" (or turned on). If the voltage is not applied, the "bit" (switch) is said to be "low" (or turned off). Bits, in this low position, are usually connected to electrical "ground", the negative side of the power supply. Just as you can easily picture six light switches together in their many possible combinations of on or off, so work the six address bits within the chip. Each of these different settings of switch combinations is termed an address; each address accesses a different allophone. This is what is known as "binary logic" (bi=two, as in the only two possible positions of high & low or on & off of the bits) and is commonly applied to differing numbers of address bit configurations all throughout the computer industry.

Words are pronounced by the sequencing of allophone addresses, each address activated producing the appropriate allophone for that part of the word's sound. Normally this is done by means of a microprocessor that:

1- APPLIES a voltage to the bits needed to establish an allophone address.

2- LOADS this address into a holding area along with the other addresses in the order needed to organize the "allophone chain" required to create the word.

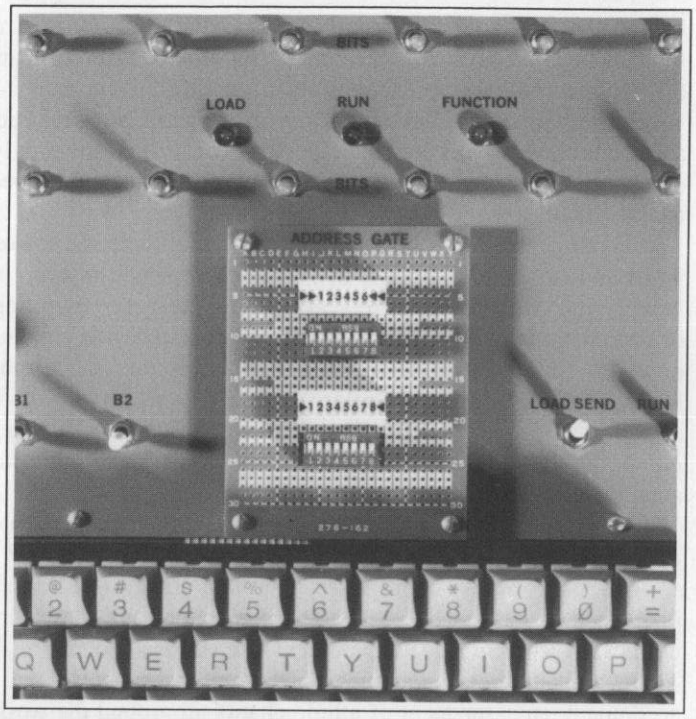
3- RUNS this series of addresses into the allophone bank where each address activates its specific allophones in swift sequence thereby synthesizing the chosen word.

So yes, normally the combining of these allophones into coherent spoken words is under the control of a microprocessor. But honestly, the SPO256 IC doesn't know whether there's a microprocessor at the other end or not. All it knows is whether it gets the *voltage pulses* it's designed to get from a microprocessor. And, as we know by now, voltage pulses are not at all hard to come by.

So no, the final voices of the Subliminal Chant Generator are not under microprocessor control. Though I've ported the instrument to accept the voltage strobes of digitally-encoded inputs, I've never applied such. The intended microprocessor is missing. In its place I've substituted an even stranger and much less predictable device... a human.

Essentially, the SPO256 IC has only a handful of really

* "Circuit-bending" refers to the process of creative short-circuiting by which standard audio electronics are radically modified to produce unique experimental instruments. A further description of these techniques can be read in *EMI* Volume VII #1, Sept. 1992.



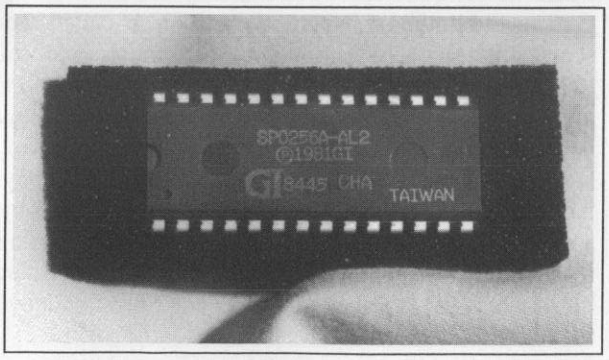
Upper left: The Subliminal Chant Generator

Center left: Controls. Upper panel is set at an angle tilting toward player.

Lower left: Access. The upper control panel hinges upward from the back to reveal electronics and battery compartments.

Upper right: Address Gate. Addresses in use can be monitored by watching the numbers on the Address Gate's oblong white blocks. These blocks are "bar graph" LEDs. Behind each number rests a red LED which lights as the corresponding keyboard keys are struck to activate the bits identifying an address. Each voice IC has its own block; six-bit for the simple allophone generator and eight-bit for the clock talk generator. Below each block are the small switch arrays (D.I.P.s) that can be removed from their IC sockets to allow connection through these same ports to various outboard microprocessors for speech control. These small switches simply close the auxiliary address lines in the present configuration.

Lower right: Integrated Circuit. A spare SPO256 allophone generator IC with its pins plunged into anti-static foam for safe keeping.



necessary pins (the actual thin metal leads extending the inner micro-circuit outward from the plastic "chip's" body) relative to the functioning of the device, especially when wired in simple configurations. Six of these pins are the allophone address pins (there are actually eight address pins on the SPO256 IC; bits 7 & 8 are not needed to address the 64 allophone locations and are meant to be connected to electrical ground). There are also pins for the "LOAD" and "RUN" functions as mentioned above.

These pins, again, are like on/off switches. The same small DC current, usually around 5V, when applied to any of these pins turns them on and activates their function. That's all the missing microprocessor is meant to do. It turns these solid-state switches on and off in the intended order, and does this *very fast*. So, imagine yourself sitting with a bunch of push-button switches in front of you, each wired to send 5V into one of the necessary addressing or function pins of the SPO256 IC. Outside of the missing microprocessor's speediness, now *you* can deliver the same on-off information to the IC's pins as needed to activate the speech sounds. Here's how it works...

The instrument's "computer keyboard" seen in the pictures was bought as a stand-alone unit. As is the rule, each key on such a keyboard is nothing more than a push-button electrical switch. Just like a doorbell's push-button. The keyboard's use in this instrument, therefore, is as nothing more than a push-button matrix; the familiar key designations have no meaning here.

Six keys in the top row of letters are connected to the six allophone address pins. Off to the sides of these, two more keys connect to the "load" and "run" functions. Simply, the player presses and holds a combination of address keys while tapping the "load" and "run" keys to activate and hear the artificial speech elements created.

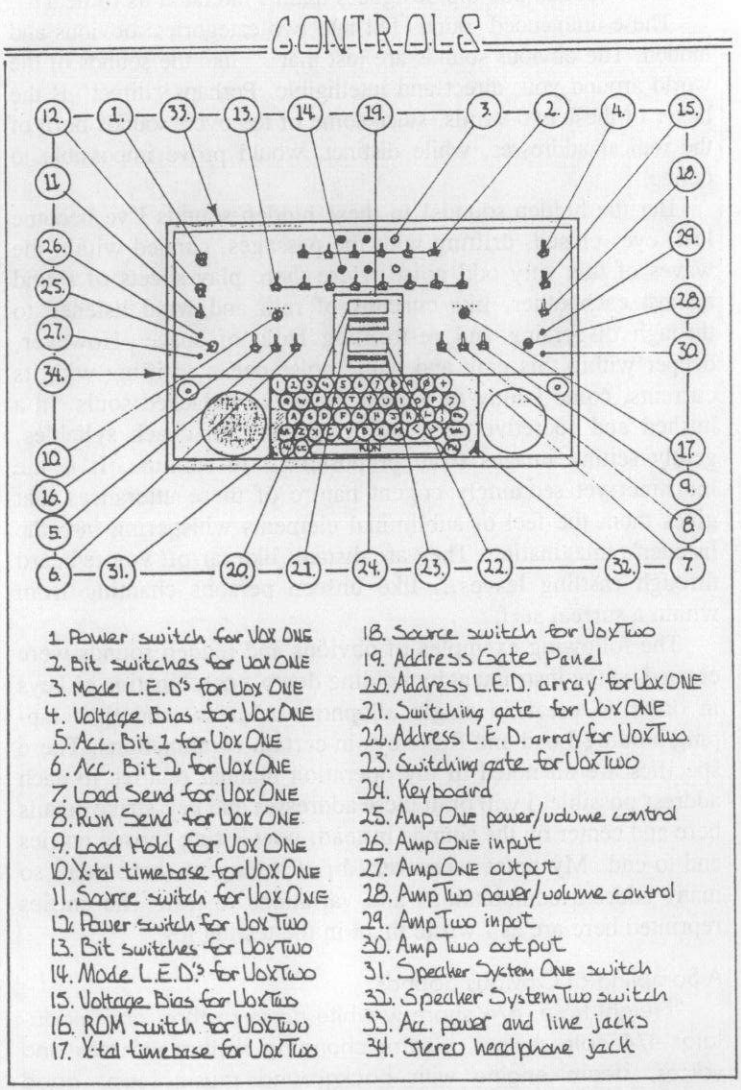
As mentioned early on, the Subliminal Chant Generator uses two human voice synthesis ICs. The second IC is nearly identical to the one under discussion. The main difference is that this second IC, the SPO256-AL2, was distributed with an accompanying smaller IC. This additional chip is a ROM IC (Read Only Memory) containing binary addressing codes that when sent to the allophone set in the partner IC creates "clock talk". That is, it speaks all numbers ("one", "two"..., "thirty..." etc.) and phrases ("It is", "O-clock", "P.M." etc.) needed for talking timepieces. In addition, for personality sake, it also exclaims "Attention Please" and "Please Hurry" as well as playing several nerve-racking tunes.

Since it is impossible to hit all the keys quickly enough to create true speech, we are left with a machine that is more capable of streaming the key-struck allophones in a rhythmic but verbally abstract manner. Out of this approach grow endless patterns of allophone cycles sounding much more like alien chant than speech or song. I presumed this to be the end result of such an approach to wiring the ICs in this rudimentary way. But I also knew that there were other possibilities, uncharted, within these voice synthesizers to discover...

Both of these ICs provide for eight-bit addressing. The stand-alone allophone chip uses, as mentioned, 64 addresses of the 256 addresses theoretically available in a binary 8-bit addressing scheme. And the second allophone chip, the one with the partner clock-talk IC, uses only 36 of its 256 possible addresses. Wouldn't that make you wonder what sounds reside at the remaining 412 addresses?

Beyond this, the "LOAD" and "RUN" functions are immediately latched to each other when under the expected control of a microprocessor. Here, with keyboard switches now triggering these functions, there is no such prescribed connection. That is, there are pauses, as long as the player might want, now possible between the key-strokes of address loading and running. It is also possible now to hold the "LOAD" or "RUN" keys down, sustaining an electrical reality that was meant, under the missing microprocessor's control, to be but a momentary pulse. These new pauses and holds, along with the unused addresses, revealed the real sonic surprises. These undocumented, not-meant-to-be-heard sounds, are at the heart of the Subliminal Chant Generator. I'll try describe them in a moment.

On the last page of my elaborate and needed manual for this instrument I've written: "There are two million, three-hundred and thirty-nine thousand, two-hundred and ninety-six direct switching combinations." To arrive at this number, along with all the combinations of allophone addresses, also come into play the timing banks I've added to both ICs. Each IC needs its operating frequency set by means of a 3.12MHz electronic "crystal" to produce realistic sounding speech. I've added supplementary crystals, selectable by means of rotary switches, to provide operating frequencies both above and below the standard. Each IC can now speak in pitches from growls to squeaks.



Control Designations
A graphic, reduced in size, from the instrument's operation manual.

The remaining controls on the instrument include other switches that can couple "load" and "run" functions between the ICs. Each IC also has a switch for endlessly repeating addresses held down. Still other switches will reverse voltage polarity to trigger sounds at key-release rather than key-strike. Additionally, the addressing keys of each IC are duplicated above the keyboard as rows of toggle switches providing the capability of "locking in" an address without having to hold the keyboard keys down. Each IC has LEDs to indicate stages of Load, Run and Function, as well as eight more LEDs in a bar configuration that flash in concordance with the 8-bit address in effect. Beneath these lighted bar arrays tiny "D.I.P." switches occupy IC sockets which otherwise could be connected to the missing microprocessor.

Also built into this housing, being an antique fluted silverware case, are a pair of amps with two-way speaker systems. A stereo headphone output is located on the left side of the case; RCA phono outputs and DC power inputs are on the back. Two screws can be removed from the sides allowing the entire control panel to hinge upward from the back, thereby revealing the circuitry and battery compartments. Handle, latches and soft rubber feet complete the case's fine-grained refinished wood.

But what does it sound like? What is subliminal chant? What are these sounds that the designers hadn't intended us to hear?

These unintended sounds fall into two categories: obvious and hidden. The obvious sounds are just that ... like the sounds of the world around you, direct and intelligible. Perhaps "direct" is the better of these two words, since some of the overt sounds born of the radical addresses, while distinct, would prove impossible to define.

But the hidden sounds! In these hidden sounds I've become lost, eyes closed, drifting with the passages, carried within the waves of this very odd noise. Here there play sheets of sound against each other, like curtains of rain and wind listened to through dispersing and re-forming halls of space. However, deeper within this pink and white noise ocean, drifting with its currents, come faintly to the ear voices of detached souls. In a hushed and secretive way they chant in Rorschach syllables, gently setting images from preposterous to sublime. It is the indistinct yet seemingly cogent nature of these utterances that gives them the feel of subliminal elements whispering into the listener's imagination. They are distant, like far-off voices heard through rustling leaves... like unseen persons chanting from within a surreal surf.

The following examples of obvious and hidden sounds were created on the instrument by holding down a combination of keys in order to create a single allophone address, and then tapping/holding Load and Run keys in certain combinations. These specifics are all noted in my operation manual relative to each address possible. I will omit these addresses and key-strike details here and center on the sounds instead, now listing chosen entries end-to-end. My notes were very brief seeing as there were so many address combinations and variations to test. The entries reprinted here are as I wrote them in the testing log.

A Sampling of Obvious Sounds:

"Freight train; 6/4 snore w/white noise rhythm; ring modulator 4/4 note rhythm; bizarre changing rhythm w/notes and voices, steam engine with background music loop; good voice/noise/note vibrato; good chatter; bizarre glottal pulse; insane squawking; interesting rising pulsed industrial sounds; ever-changing noise rhythm; sweeping pitch with sharp clicks; metallic vowel pulsing; crazy on-going noise samples with two-step sputtering notes; background of chanting female voices; weird "ah" voice; vocal chirping noise; interesting percussive overtones; great vocal-note sustains; random noise-note patterns dropping in pitch; deep reverb vibration; sneeze rhythm; explosion gale; good scratching sound; electronic chatter; great whistles inside crazy noise rhythm; quick filter sweep; very strange noise patterns in echo; insane vocal/noise pulse; beating garbage can; intense marching sound; slow noise abstractions and deep mumblings; metallic cat-scratching sounds, noise burst pattern into silence; 3/4 snare drum; strange vibrating rhythm-beat; bee-buzz rhythm; deep vocal noise pulse; motor sounds in good random patterns; long changing noise intro into noise/tone vibration; squeak-beats in hum-note cycles; factory clanking; wonderful noise-vocal-note cycles; good hammer sound with oblique chanting; thick buzz and booming sounds; bell effect; lion's roar; bird vocals; strange air-rhythm; silence with dog barks, thunder & crickets; storm effects; pig grunting; burping rhythm; noise/clap/noise beat; cheering vocals with sharp pulse; long and varied note descents; growl-beats; odd horn warbles; interesting pseudo beat; gulping beat; good storming roar; hammering nails in wood; gargle drums in silence", etc.

The "hidden" sounds are much stranger than the "obvious" sounds, above. It should be noted again that the "hidden" sounds, listed below, are usually heard through waves of rainy-windy noise. Their impressions are very subjective. I've handed the headphones to assorted persons to ask if they could hear what I thought I was hearing, asking them to pronounce what they imagined being said. Yes, they heard voices too, but the voices chanted very different things to them than they did me, setting the following as mere generalizations. The term "subliminal," as used in the notes below, signifies sounds just at the edge of perception. These are often the sounds of vague chanting, speaking and singing, but might also be shadowy mechanical noises, musical tones or indescribables. Perhaps St. Gregory felt as at a loss trying to notate the songs of a dove, in his time before written music, as I did in attempting to document these complex subliminal sounds. The experience of listening to these spirit-like voices escapes any attempt to document them in text, but these brief examples from the test log might give some idea of the voice's ethereal realm.

A Sampling of Hidden Sounds:

"Subliminal rhythms in mist; dense subliminal sounds in space gun; subliminal string section swells; subliminal spoken "no place this time" repeating; great subliminal voices and notes; subliminals in watery sustain; subliminal tunes run in and out; subliminal tune with spoken "ship, ship, ship..."; subliminal conversations and crowd noise; wonderful jet noise with subliminal chanted "they go away" wording; subliminal tune with following vocals; subliminal notes and male voices in female "ffffff" sound; subliminal chants in swirling sounds; dense pink noise with bursts of subliminal sounds and voices; subliminal voices in cavern saying "sssssick sick sick"; syncopated subliminal chants in windy field; very abstract subliminal voices and animals; subliminal voice in sheet metal beating; subliminal nature and storm sounds; subliminal talk in 'dial tone'; subliminal spoken "one, then then then" repeats with distant notes and

smaller voices; sweeping hammer sounds with nice chanted subliminal rhythms; subliminal repeated words in deep bee buzz; subliminal chant and bells in windy place; random subliminal voices and singing; subliminal sustained phonemes; subliminal "them, them, them"; subliminal beat with following voices; nice vocal-noise subliminals in echo waves; very odd punctuated subliminal chanting in very nice water sounds; subliminal "nigh nigh nigh" and "dime dime dime" repeating; random subliminal cries in air-brake sounds; great subliminal voices and beats in distant hissing; subliminal chants with bass drums", etc.

In reality, when listening to the above sounds all kinds of subtleties and variances become apparent. The voices are often rich with details that define them in unique ways. These brief notations were written more to remind me of the sounds than to describe them.

"Spirit radios" are a historic curiosity. On file are many designs for recording or listening to the voices of departed souls through special electrical receivers. The voices are described in such ways as to clearly parallel them with the murmuring of the Subliminal Chant Generator. However, even without the prior knowledge of these devices there is the inescapable feeling shared by all players that this voice synthesizer is a special device capable of listening in on another world's whispers.

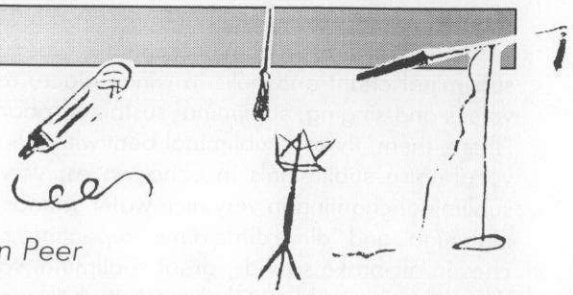
The broad scope of speech artifacts, musical sounds and assorted noises found within the Subliminal Chant Generator's original and newly-discovered addresses provide a vast assortment of elements for composition. As simply an abstract human chant synthesizer, using only the original design's allophones, an intriguing interface for rhythmic vocalizations awaits the fingertips. But beyond this, circuit-bending's revelation of alien and subliminal voices again suggests strange new worlds of music waiting to be heard... to be nudged into shape. Perhaps similar to the way in which music has nudged us into shape.

Strange.... you would think that in a global society whose modern music almost invariably springs from ecclesiastic worship that songs of such praise would still predominate. Not the case. I've heard that the two most frequent musics of the planet are simple love songs and drinking songs, now leaving me to guess which was sung first. Actually, I do remember once being told: "A beer did that"...

Great thanks to Mark Shaw and Henry Shaw for their research and editorial assistance.

Contact Reed Ghazala at the Anti-Theory Workshop, c/o Sound Theater, 3325 South Woodmont Ave., Cincinati OH 45213, USA; email qrg@anti-theory.com.

Reed's full-color Anti-Theory Workshop catalog is available. For more information, see his notice in this issue's Notices column. For a recent interview with Reed on the World Wide Web, go to http://www.furious.com/perfect/emi/reedghazala.html, and for reviews of his works, try http://207.137.50.71/reviews/.



RECORDINGS REVIEWS

By Warren Burt, Mitchell Clark, Bart Hopkin, Dean Suzuki and René van Peer

KEN BUTLER: **VOICES OF ANXIOUS OBJECTS**

Tzidak, TZ 7402 (Tzadik, 61 E. 8th St., Ste. 126, New York, NY 10003)

Butler is best known for his so-called "Hybrid Instruments," first created in 1978. Taking common utilitarian objects, he transforms them into visual and aural art works. His first such piece was the "Axe-violin," in which a small hatchet was fitted with a violin neck, bridge, tailpiece, chin rest, strings, tuning pegs, and a small contact microphone. It even fits neatly in a violin case. Because Butler chooses contact microphones, the entire instrument becomes a kind of soundboard, such that it can be bowed, plucked, tapped, and scraped. Instruments range from the simple, as with the "Hammer-viola," even more Spartan than the "Axe-violin," with only two pegs and strings, a rudimentary bridge and a contact microphone attached to a standard wood-handle hammer; to the more complex and whimsical, as in the case of the "Hockey-racket," comprised of a tennis racket, a hockey stick, two combs, a door stop, a puck (?), various clips, springs and other junkyard flotsam and jetsam, or the "Cane-racket," with a metal tennis racket, a metal cane, Jew's harp, electric outlet plate, saw blade and other metal objects that one might find in a hardware store. The 16-page booklet that accompanies this release contains plenty of color photographs, including those of many other instruments not included on the CD, such as hybrid gun/rifle instruments, and those made from de-constructed musical instruments that are reminiscent of Picasso's cubist paintings of guitars and other string instruments. Butler performs on his instruments in a style that derives from jazz, free improvisation, world music and perhaps minimalism (there are plenty of ostinatos which provide the basis for improvisation). Butler is joined by bassist Stomu Takeishi, percussionist Seido Salifoski, who performs on dumbek and tapan, in addition to more conventional percussion instruments, and multi-instrumentalist Matt Darriau who performs not only on Western woodwinds, but also on gaida (a Bulgarian bagpipe), kaval (a Bulgarian flute), shenai (an Indian double reed), plus miscellaneous flutes and reeds. The style is adventurous, with some free-wheeling improvisations on these incredible instruments, yet accessible, in so far as there is a stable, tonal, pulsing foundation upon which the improvisation takes place.

— DS

HOHNER COMPANY: **CLAVIOLOGY**

CD from Hohner, Hohnerstrasse 8, D-78647, Trossingen, Germany, phone 07425/20425.

The claviola is a free-reed instrument newly invented and produced by the Hohner Company. Hohner has for many generations been the leading manufacturer of harmonicas, accordions and other instruments of the free-reed family, and was the leading innovator in instruments of this type in the latter 1800s, when they first took hold in Europe. (For more on this history, see "The Free Reed" by Michael Hearst in *EMI* Vol. 13 #3, March 1998.) The CD being reviewed here is a promotional demonstration recording that Hohner has put out for the new instrument, containing six musical selections in widely differing styles for claviola with synthesizer accompaniments. Not surprisingly, the pieces chosen for the demonstration CD represent a lowest-common-denominator middle-of-the-road musical aesthetic; no further comment is needed on that subject. So let me focus on of the instrument itself and its sound.

The claviola, developed for Hohner by their resident genius Ernst Zacharias, is a hand-held, mouth-blown free reed instrument with a small keyboard. In this sense, though the look is different, it is a bit like the melodica that Hohner released with some popular success three decades or so ago. But it differs from earlier Hohner free reeds in that each reed has its own tuned air resonator tube. This gives the instrument a very different tone from other instruments in the free reed family. Gone entirely is any sense of a thin, reedy sound; it is replaced by a warm clarinet-like fullness as the air resonance imparts a generous ampleness to the fundamental. The tone is extremely stable (little unwanted pitch bend), but there is an additional feature which allows some degree of bend or vibrato, independent of breath intensity. It's not clear from the written descriptions how this vibrato mechanism works. But while the performances on the CD are a bit antiseptic, I've been told by Mike Hearst, the author of last issue's Hohner article, that the instrument really is more flexible than the CD would lead you to think, and has potential for some intriguing outside effects. Such a dark and lovely sound, too.

— BH

TEIJI ITO: **MESHES**

¿What Next? Recordings WN0020. Now available from O.O. Discs, 261 Grovers Ave., Black Rock, CT 06605-3452; e-mail: cellioo5@aol.com

When I first saw Maya Deren's film *Meshes of the Afternoon* a few years ago, it was as part of a program organized by the Knitting Factory in which they had musicians write or improvise music to classic silent movies. I don't remember much of the film, only that it was ritualistic and nightmarish in the way that often repeated scenes and shots built up an ever more intense feeling of threat. It turns out that this was not the first time music had been composed to go with this film. In 1959 the Japanese/American composer Teiji Ito, husband to Deren, recorded a soundtrack for it. The What Next label has taken the recording (on which Ito very probably plays all the instruments himself) from the archives where it was resting and put it out on CD, together with two other pieces of his. One must be the first composition he ever did, in 1952 at the age of seventeen, for *The Very Eye of Night* – another film by Deren. Most of the CD is taken up by a piece for a theater work, composed and performed in 1982, the year in which Ito died.

In other words, *Meshes* provides a view of the very beginning

and the very end of Ito's career as a composer and musician. According to the liner notes he "became interested in the music of other cultures, especially the percussion music of Asia, Africa and the Caribbean; in 1955 he studied with a master drummer in Haiti. His keen awareness of jazz, blues and flamenco infused his later music with a spontaneous, improvisational quality, and his knowledge of Buddhism, Voudoun and Native American beliefs added a mystical element. This eclecticism, along with his extended instrumental techniques and a kind of intentional 'neo-primitivism,' anticipated many tendencies which have since become common in much contemporary music."

Listening to the three pieces in chronological order, this becomes apparent as a development in Ito's work. *The Very Eye of Night* is in a sense the most conventional, being based on a cyclical four-note phrase and a four-beat rhythm, and using mostly Western instrumentation. In *Meshes of the Afternoon* itself Ito has drawn from his Japanese background, and not just by playing the *shô* mouth organ, the *koto* and the *hichiriki* (a double reed). The piece has the dynamic range and the sudden, almost violent, shifts in volume that can be characteristic of Japanese music; it has its somewhat indeterminate, elastic sense of rhythm; and, compared with the harmonic nature of the earlier work, the emphasis in *Meshes* is more on melody and an equal treatment of melodic and percussive instruments. Ito sings tones that glide up and down side by side with those that he bows from a cello, making its warm texture burr and buzz as if it were electric by moving minute intervals away from it, pushing himself away only a hair's breath and making it sound as if he has to summon all his strength to accomplish that.

Axis Mundi takes its inspiration in part from ritualistic music of different cultures, most notably North American Indians. Ito includes a variety of instruments that one would readily associate with ceremonial use, such as rattles, whistles, didjeridus, the *berimbau* (the Brazilian mouthbow, known from *capoeira* music) and conch shells. Although at times he comes close to copying music from other cultures ("eclecticism" as the liner notes have it), he generally manages to remain true to a more personal expression, which is as much musical as it is ritual.

One would perhaps conclude from the above description that Ito was a precursor to world music and new age. On the evidence of these pieces that would not do him justice, in my opinion. Maybe in making his music he used methods that are similar to what is common in those two genres, but the result sounds like it is a translation of what lived inside the man rather than like a formal blend of styles. It seems that this is the first release of Ito's music. That in itself makes *Meshes* a valuable album. What adds to this is Ito's stunning mastery of all the instruments he plays and the surprising sound quality, especially remarkable in the 1952 composition. But then, it was recorded by electronic music pioneers Louis and Bebe Barron.

— RvP

MACIUNAS ENSEMBLE AND KANARY GRAND BAND:
LIVE WITH THE BIRDS

Apollo Records ACD 129615 (Het Apollohuis, Tongelresestraat 81, 5613 DB Eindhoven, The Netherlands)

In *Live with the Birds*, the Maciunas Ensemble, a group of four — consisting of two artists, a scientist, and a musician — create a large collective ensemble together with the Kanary Grand Band, a group of about forty — consisting of canaries, goldfinches, siskins, titmice, nightingales, and greenfinches. The work is, straightforwardly, in four sections: "Man and Bird," "Man," "Bird," and "Bird and Man." This is the second Het Apollohuis release which has involved the birds of their aviary, the first having been *Singing the World into Existence* (Apollo ACD 039212). Concerning Het Apollohuis (and, unfortunately, its closing), see *EMI*. Vol. 13, No. 1 (September 1997), page 6.

The members of the Maciunas Ensemble improvise on long aluminum wires, which appear (from the booklet photos) to stretch from ceiling to floor, where they are anchored to rocks. These sounding wires are set into vibration by a number of methods, including tapping, bowing, and friction. According to a note by ensemble member Paul Panhuysen, the birds were inspired by these soundmakers, and joined in as improvising musicians from the moment they first heard them.

Often in *Live with the Birds*, the Maciunas Ensemble and the Kanary Grand Band seem to be happily coexisting, and without much interaction. But there are some remarkable surprises. One instance is an extended passage (lasting about two minutes or so) a little past half way through "Man and Bird," the first and longest piece. Here the Maciunas Ensemble settles into a loosely repetitive pattern, and the Kanary Grand Band does the same. Each articulates this section in its own way: droning metal sounds for the M. Ensemble and a variety of vocalizations for the K.G. Band. That the repetitive sequences which the two groups settle into seem to be matched in terms of their temporal periods, and that this happens in a flowing and relaxed way, makes this one of the magical sequences of *Live with the Birds*.

— MC

RON STROJNY: **MASTER CIRCLES**

Cassette from Ron Strojny, 735 Robinhood Lane, LaGrange Park, IL 60256-1576

This is a homemade artist's-edition cassette, which was originally released with *Kelebration*, a xeroxed writer's 'zine. The illustrations in the 'zine (not made by Strojny) are all appropriations from popular culture. The music on the tape is, similarly, a collage of bits and pieces from the media and the composer's everyday life. It's a first effort by a composer I hope we hear more of. Reminiscent of other midwestern collage groups such as Public Works (formerly The Tape Beatles), the music is a dense but genial combination of many sounds made on a home 8-track deck. Full of fun quotes from movies, TV, and other sources (my favorite is a Brooklyn-esque voice saying: "There ain't no grammatical errors in a non-literate society"), it also features sounds from a lot of non-traditional sound sources, such as zippers, blenders, wind-up cars, TV antennas, cardboard tubes, microwave popcorn, ratchet wrenches, balloons, etc. One interesting element of the mix for me is the different roles that a rock drumbeat assumes whenever it appears. At the beginning of the tape, it clearly dominates, but after a minute or two, it disappears. When it reoccurs sporadically later in the piece, sometimes it dominates, but more usually it is placed back in the mix, until near the end of the piece, it becomes just one more element in a mix, something that I didn't think was possible with this socially-loaded, socially-omnipresent sound. Another fun element are the recordings from everyday life which appear every now and then. The dialog where two parent types try unsuccessfully to get a very strong willed child to sing the ABCs for the microphone should gladden the hearts of anarchists everywhere. Every copy of the cassette comes with a different handmade cover, along with various surprises, such as fortune cookie fortunes, etc. The overall

feeling of the tape is of enthusiasm for exploring the sound environment, and the sound quality, considering the wide range of material in the mix, is surprisingly high. As stated above, I hope we hear more from Ron Strojny.

— WB

MARTIN TÉTRAULT: **LA NUIT OÙ J'AI DIT NON**

CD from Audioview Audio 003. Lowlands Records, Hoornstraat 6, 2000 Antwerp, Belgium (e-mail: lowlands@innet.be)

When listening to turntable musicians I often feel tempted to identify the fragments they use to construct their pieces. This exercise can both be entertaining and annoying. Entertaining because of the game element in guessing. Annoying because it stands in the way of getting into the music itself as it is created from such sonic readymades. On *La nuit où j'ai dit non* (the night in which I said no) Martin Tétreault has managed to create a bypass around that. You do hear the scratches of damaged vinyl; you do hear the characteristic repeated bounce of locked grooves — evidence of the process through which this music was created. The care and craftsmanship with which Tétreault has chosen the sequences and woven them together has resulted in coherent pieces. Even when you can distinguish different layers, such as rhythms from one record and synthetic sounds from another, they fit together. Even when these layers are markedly disparate (for instance, when rhythms are so much out of synch that the ongoing motion almost topples) they sound well matched.

Tétreault has been so friendly and helpful as to provide the titles of the twenty-five albums that his music is derived from. They include a significant number of LPs with electronic music and sound effects, works of serious contemporary composers (Elliot Carter, Charles Wuorinen, Morton Subotnick and Pierre Henry), but also *Imaginations 2 pour l'expression corporelle* and *Le pays de tout en tout* - two records that I probably would not recognize for what they are under whatever circumstance.

The combinations that Tétreault has forged are a pleasure to listen to. On the second track he has swollen chords tugged along by a rhythm that is definitely dragging its feet, whilst electronic bloops and bleeps and swishes and swooshes taunt its pompous presence. It is in fact the more incongruous juxtapositions that give this CD extra charm. I, for one, can't help smiling when I hear really serious and heavyish music underpinned by an unstoppable propulsive drum beat — as if a madman was hired as a cowboy to herd an orchestra. One detail that I found quite nice is when scratches on an LP can be heard reverberating around a room. It's then that Tétreault turns even that sound into music, instead of remaining an unavoidable side effect of the sound sources used.

— RvP

PAULINE OLIVEROS: **ELECTRONIC WORKS 1965 + 1966**

Paradigm Discs, London 1997; CD nr. PD04 (available through Electronic Music Foundation; www.emf.org)

PAULINE OLIVEROS: **ALIEN BOG AND BEAUTIFUL SOOP**

Pogus Productions, PO Bodx 150022, Van Brunt Station, Brooklyn, NY 11215-0022; CD nr. P 21021-2 (www.taojones.com/pogus.htm)

DAVID MAHLER: **THE VOICE OF THE POET**

Artifact Recordings, 1374 Francisco St., Berkeley, Ca. 94702; CD nr. ART 1019; (www.artifact.com)

Here are three CDs of electronic music classics played on the original, and now obsolete, instruments. The principal instrument in all three is that beloved dinosaur, the analog tape recorder, with ¼-inch-wide tape streaming across the heads. In all three CDs, the idiomatic characteristics of the instrument were exploited by the composers. In Oliveros' case, the tape was stretched from one machine to the other, and the outputs routed back to the inputs of the machines, in order to create extended delay and repetition patterns. In Mahler's case, cutting and splicing the tape in a virtuoso manner provides the musical interest. The Oliveros CDs are further interesting in that they use a variety of early electronic sound generating equipment. In the case of the *1965+1966* album, the instruments are test oscillators and homebrew oscillator/keyboard connections from the University of Toronto Studio; for *Alien Bog and Beautiful Soop*, the instrument was Donald Buchla's first Series 100 analog synthesizer.

"I of IV" is the opening piece on the *Electronic Works 1965 + 1966* CD. It was previously available on an Odyssey LP, and it's good to see it available again. It's a marvelous piece, with thick and rich textures created by a technique Oliveros called the "combination tone" technique, where a number of oscillators are tuned higher than we can hear, and one is tuned lower than we can hear. When these are mixed, they produce tones we CAN hear, with rich timbres, and an often arresting rhythmic presence. These tones are then fed into a tape delay system, so that each sound is heard a number of times — in effect, the tape delay system creates a musical canon, with each successive voice of the canon getting softer and softer. The overall effect is one of swimming in a sea of slowly changing sound, with occasional subsonic sounds that will make you *sure* that there is a car idling just outside your window. "Big Mother is Watching You" uses a similar process, but in this case filtered pink noise is used as one of the inputs to the mixer. The result is a piece of deep scratching noisebands — rich, aggressive sounds that you'll be able to hear lots of things in, though how many of them are actually there, and how many are the result of aural hallucinations from the ear overloading on information is hard to tell. It's a powerful piece, and, at 33 minutes long, one that is a challenge to even the most seasoned electronic music listener. Fans of such "noisicians" as Merzbow should definitely have this disc — to see where the roots of the genre lay. "Bye-bye Butterfly" is a much shorter and lighter piece. Here the inputs are two test oscillators and an LP record of an excerpt from Puccini's "Madame Butterfly." Processed through the delay, electronic glissandi weave around the blurred edges of the Puccini quotes — not only is this an interesting sound in its own right, but it's also rich with implications of Pauline's feminist take on the sexual politics of Puccini's opera.

"Alien Bog" and "Beautiful Soop" are two pieces from later in 1966 and early in 1967. Made in the Mills College Center for Contemporary Music on the first Buchla Synthesizer, the delay system is also used here. In "Alien Bog," a wide variety of analog sounds are used, from very pure waveforms to rich modulated sounds. The distinctive sound of the Buchla spring reverb units are also heard here. These sounds are shaped into a number of recurring motifs, with new material being added along the way. The piece is a long, leisurely soundscape, gradually building and ebbing in thickness. Some of the modulated analog sounds are quite beautiful, and the simpler sounds are always shaped into interesting melisma. Of all the pieces on the two CDs, this is my favorite. "Beautiful Soop" is another piece where a phonograph record is played into the delay, along with the Buchla synthesizer, and a microphone for Oliveros' voice. The record here is of two

actors reading Lewis Carroll's poetry. Oliveros voice comments on the poems. Where in "Bye-bye Butterfly," the comments are implicit, here they are upfront, and quite humorous. The combination of serious investigation into new timbres and structures along with a sense of humor and wry comment makes this early work of Pauline Oliveros' irresistable.

David Mahler is a generation younger than Pauline, but the sense of humor and comment in his work has a lot in common with hers. The illustration on the back of the CD is of a single edged razor blade, that on the front is of 7 inch analog tape reels. Familiar sights to many of us who grew up in that era, they would be antiques to a younger generation reared on computer sound editing. After working with digital editing for several years, it's good to hear these works, to be reminded of just how much was possible with the older technology. Putting the editing in the computer has made things easier, but not necessarily any more rewarding. These virtuoso works show just how important the ideas behind a piece are, regardless of the technology used. "Cup of Coffee," the opening work, is a simple exposition of the possibilities available in fragmenting a single phrase in many different ways. "The King of Angels" is a similar collage, but this time using fragments of Elvis. In the latter part of the piece, spliced phonemes allow Elvis to sing his own name. Of the many Elvis tributes/demolitions I know (others are by James Tenney, Ron Nagorcka, Michael Daugherty), this one is my favorite. Abstract and very beautiful soundscapes are assembled in "Rising Ground" and "Wind Peace." In the former, spinning disks of metal are recorded and mixed together; in the latter, the sounds of crystal glassware and aluminum pie pans are shaped into elegant and luscious textures. The high point of the CD, though, is "The Voice of the Poet," an almost 18-minute deconstruction job on an interview between composer Ingram Marshall and Seattle radio personality Jim Wilke. This hilarious piece will keep you smiling from beginning to end. If you know anything about new music, some of the in-jokes will cause you to laugh out loud. If you don't know anything about new music, you'll still be laughing at the lunatic juxtapositions, and the way Mahler's skillful reassembling makes both Marshall and Wilkie say things that they never, ever, said (or probably wanted to say). As Larry Polansky says in his liner notes, Mahler has a "terrific and terrifying sense of humor" and is a "master tape splicer with extraordinary ears."

— WB

WILLIAM EATON ENSEMBLE: **NAKED IN EUREKA**

Canyon Records CD nr. CR-7022. Canyon Records Productions, 4143 North 16th Street, Suite 6, Phoenix, AZ, 85016

GWEN JONES: **OCEANS OF LIGHT**

Raindreaming CD - RD88 - Raindreaming Productions, PO Box 697, Point Reyes, CA 94956

NADOYA MUSIC AND DANCE COMPANY: **KAGOME**

AMN Productions, CD AMN002 - AMN Productions, Suite 350, 45 Glenferrie Road, Malvern, Vic. 3144, Australia

PASCAL HOLZER: **11 THEMA POUR ARTE**

Audiorama CD Court 5 - Audiorama, B.P. 161, 67004 Strasbourg Cedex, FRANCE

BAKSHISH: **FOUR FIFTHS OF THE WORLD**

Privately released CD from http://www.bakshish.org

Slowly but surely, as the media throw different cultures into contact, we are evolving not one, but many different cross-cultural and cross-stylistic musics. Some of these seem immediately successful, providing unique delights. Others seem more problematic, but may in time reveal themselves to be equally full of unsuspected pleasures. Here are five CDs from around the world that all use invented or non-traditional or non-Western instruments, and all of which feature a multi-faceted, multi-cultural approach.

William Eaton is well known for his beautiful lyres and lyreharp guitars. In *Naked in Eureka*, he is joined by his ensemble, which features Native American singer Mary Redhouse, New York based flutist Claudia Tulip, African-tradition drummer Keith Johnson, cross-genre violinist Allen Ames, and cross genre percussionist Will Clipman. The music that they make is joyous, with several different styles combining in each piece. Perhaps "country" or "folk" would be the predominant style here, but even to use those terms is only to locate the general area of the music in the broadest terms. There's also jazz, new age, and classical influence as well. But it's never a mish-mash — it's always coherent, making its own statement with integrity and gentleness. Good musicians from several different traditions playing together, making a music from their common heritages. Eaton's string instruments here are not as much to the fore as in his collaborations with R. Carlos Nakai — they are subsumed more into the ensemble sound, but their unique timbre can still be heard clearly. Well worth a listen.

Also well worth a listen is *Oceans of Light* by Gwen Jones, a Bay Area multi-instrumentalist. I had known of her work through a number of dancers she had worked with — hearing her work off cassettes that had been dubbed from cassettes etc. So it's a great pleasure to hear the work on a CD, in full fidelity. Many different non-Western and folk instruments are used here — Tibetan horns, gongs, and bowls, sona (Chinese oboe), gya-hu (Chinese cello), shruti box, ektars, box mbiras, and didjeridu among them. Western instruments are represented by the pocket trumpet, bass fiddle, guitar, and the fujara, a Slovakian shepherd's flute. Multitracked by Gwen Jones and Norman Rutherford, again the playing, composing and improvising rise well above the category of mere stylistic combination. Within a very general concept of a drone or modal-melodic style, each of the tracks on the CD makes a clear, strong and lovely statement. I must admit that when I saw the list of instruments on the album cover, I was a bit apprehensive — but on listening to the album I was completely won over by the sensitivity, sincerity, and beauty of Gwen's music.

Despite the rise of the lunatic racist right in recent elections, Australia remains one of the most multi-cultural places on the planet. More than 50% of the country's population is either first or second generation migrants. So it's not surprising to see cross-cultural groups and musicians flourishing here. Nadoya is one of the most interesting of these. It consists of musicians Anne Norman, a shakuhachi player who has spent many years in Japan; Japanese koto player Satsuki Odamura; multi-traditional percussionist Peter Neville (who is just as much at home playing Ferneyhough as Indian rhythms); bass player and techno-whiz Michael Hewes; and three dancers: Yumi Umiumare (from Japan), Tony Yap (from Malaysia), and Lynne Santos (from Port Melbourne). *Kagome* is the soundtrack from a collaborative music/dance work developed by the entire group, which took its starting point from the Japanese children's song of the same name. Everyone in the group contributes vocals at some point, while classical Japanese, classical Western, rock, Japanese folk, and

Western avant-garde techniques exist side by side. The sheer good will and cooperativeness of the group is manifest in the many kinds of playing. The koto can just as much be expected to play a Western chord progression as the bass can be expected to bend notes to match the koto in traditional Japanese mode. Norman's shakuhachi is extremely versatile, sounding pure Zen one moment, and Western-minimal the next. Along the way a whole variety of other sound sources are used, such as ken tieu (Vietnamese oboe), a steel bowl from the top of a power pole, steel drums, toy cicadas, and even crutches (from one of the dancers who broke a foot in rehearsals!). And yet, like the two albums above, its all done with integrity and concentration, making a music that is unique to its own cross-cultural time and place, and is very beautiful.

I have a few more problems with Pascal Holzer's *11 Thema pour ARTE*. These are eleven very short pieces (the CD only totals 19:40) which were composed as theme music for the French/German TV program ARTE. Each episode of the program deals with a different topic, and thus, the theme music for each episode has to reflect the content of the show. This provides quite a challenge for the composer, but also the opportunity to use and explore a wide variety of sounds and sound sources from around the world. Sounds from Marocco, Jerusalem, Mexico, Los Angeles (riot samples, of course), and elsewhere are heard. Because of the shortness of the themes (most are two minutes or less) the music can seem very abrupt, changing direction almost from phrase to phrase. However, once one accepts this convention, the music can be quite convincing, though the slick production values, required by the TV medium, sometimes work against the content of the music. Unlike all the other albums under review here, which are at least collaborative duos, this CD is one person's vision - and it's a vision which seems to arise not from some sort of inner necessity, but from commercial assignment. Still, Holzer is quite skillful and clever within the parameters of his assignments and the album is definitely worth hearing.

Bakshish is a duo from Portland, Oregon consisting of Paul Rubenstein and Viren Kamar, who have done quite a bit of playing around the folk scene in the North West US. Rubenstein plays a variety of non-Western and homemade instruments, while Kamdar plays a variety of world percussion. Some of the instruments used are bonang (Indonesian pot gongs), tabla, Udu drums, oud, etc. Rubenstein's homemade instruments include the viotar, the invisitar, and a microtonal guitar. The music has a mostly middle-Eastern modal feel, with occasional forays into other cultural referents from Indonesia to India. One of the most interesting tracks for me was track 9, "Pani," a duet for Viotar and Tabla. The Viotar is an instrument in which the strings are both plucked and bowed. Here it sounds really out-of-tune. This is all the more remarkable because the microtonal guitar playing in the next track, and the microtonal oud playing in the final track, sound so precise and finely in tune. On second listening, I decided that the out-of-tune playing in "Pani" was intentional. By the third time through, I was mesmerized by it. Both musicians obviously bring a wealth of experiences to their playing, and the result is an attractive set of cross cultural explorations.

— WB

A note from the editor: With *EMI* set to publish its last issue toward the middle of next year, we are no longer adding new recordings to the to-be-reviewed pile. Inevitably, however, a number of new recordings relating to unusual instruments have trickled in since this policy kicked in. In lieu of proper reviews, here's a short listing providing just the essential information on a few of these too-late-for-review releases.— *BH*

PAT WAING: THE MAGIC DRUM CIRCLE OF BURMA
featuring KYAW KYAW NAING

SANDAY: THE SPELLBINDING PIANO OF BURMA
featuring U YEE NEW

Shanachie CDs 66005 and 66007. Available in record stores, or visit www.shanachie.com.

These two CDs continue the Burmese music series from Shanachie Records that began with the wonderful *White Elephants and Golden Ducks: Enchanting Musical Treasures from Burma*, reviewed in *EMI* Vol. 13 #2. The *pat waing* appearing on the first of these new CDs is a unique Burmese instrument in the form of a circular arrangement of 21 tuned drums. The piano heard on the second CD is a seemingly very un-Burmese instrument, but played in a manner that people familiar with the instrument in the West could never have conceived. The featured instruments in each CD are heard in a variety of ensemble contexts, and many of the same musicians appear on both. This is great stuff: As a follow-up to the excellent earlier *White Elephants*, these CDs do not disappoint.

NELLY VAN REE BERNARD: **CANCIONES SEFARDITAS**

Eurosound CD ES 47.279.CD, or NvRB-64.CD. Available from Muziek Centrum, Het Duintje, Bennenweg 6, F 209, 2121 GX Bennebroek, Holland

In *EMI* Vol. 12 #2 (December 1996) Nelly an Ree Bernard described her Citara, a modern reconstruction of a medieval psaltery based on an image in an illuminated manuscript. In this CD she presents spoken or half-sung Sephardic texts, accompanied by the citara. In an increasingly complex and noisy world, the perfectly plain, clear, unadorned tone of the psaltery and Nelly's understated voice are a delight to hear. Imagine a situation in which, instead of spending their time on reverb and effects, someone spends the same effort on refining the tuning of the strings to perfection; instead of playing lots of notes, the player plays fewer notes, with more grace and fluidity.

FIFTY-FOOT-HOSE: **SING LIKE SCAFFOLD**

Weasel Disc Records WD-19456

The original group called Fifty-Foot Hose was part of the psychedelic music explosion in San Francisco in the late 1960s. We reviewed the recent re-release of their 1967 LP *Cauldron* in *EMI* Vol. 12 #4 (June 1997). They were in some ways typical of that time and place and in some ways unique. Now, thirty years later, the group has re-activated itself, with some changes in personnel, and released this CD of new material. It includes Cork Marcheschi's trademark odd electronics, and lots of other unusual instruments, including Fred "Spaceman" Long's eclectic metal constructions that he calls Jokers (featured in *EMI* Volume 11 #4 (June 1996). The result is a mix of the mostly metallic homemades, the early-electronics sounds, and a bass-drums-guitar sound reminiscent of that formative era in rock. What we lose, compared to the earlier re-release, is the feeling of an intriguing and curious artifact; what we gain in the new release is a higher level of intelligence, competence, and sureness of style.

GRANT STROMBECK, BOB MARSH, GREG O'DROBINAK:
REMOTE OUTLOOK

On CD. Available from Grant Strombeck at 2237 Grove St., Berwyn, IL 60402

The leader of this session, Grant Strombeck, is a percussionist, and some of the music is steeped in rhythm and drums. But not all; much of

it is more abstract, and there are lovely textures and delicate sounds to be heard throughout. Both Grant and Greg O'Drobinak have done a lot of inventive instrument making, and many of their instruments have appeared in *EMI*. In particular, the instruments appearing in Grant's article in *EMI* Vol. 12 #1 figure prominently here.

RETURN TO ZERO: **A DEMONSTRATION**

MIKE HEARST AND JOSHUA CAMP: **CLAVIOLA MUSIC / THE KLEZBIANS**

Both on CD, available from Michael Hearst, 703 w. 25th St., Richmond, VA 23225, USA; phone (804) 233-6476

Mike Hearst and Joshua Camp comprise the group Return to Zero. Mike recently wrote the article on the Hohner Company and its recent instrument innovation the claviola in *EMI* Volume 13 #3 (March 1998). The claviola is a free-reed instrument (same sound principle as used in the harmonica) with a difference: added resonating chambers give it a full, warm, and more refined sound, reminiscent of clarinet or organ. Return to Zero's CD *A Demonstration* features the Claviola throughout, in highly varied contexts — rock, polka-like things, and pieces with something of a chamber-music sensibility. The second CD listed above, called *Claviola Music/The Klesbians* also features claviola. Particularly striking is the series of claviola duets, written in a spare and refined contrapuntal style, tonal but highly chromatic. The last half of this CD — the "Klesbians" part — is less relevant to *EMI*, since it doesn't feature non-standard instruments. It is enjoyable though, being a collection of standard Christmas carols mapped onto middle eastern scales and played in klesmer style. Who knew there could be so many augmented seconds in "The First Noel"?

You may contrast Mike and Joshua's claviola music with the promotional CD put out by Hohner company for the instrument, reviewed elsewhere in this section.

"Three Bags Full" new CD by PETER WHITEHEAD now available. A compilation of scores for film and dance performances all composed using original instruments featured in *EMI*. Send $15 to Strange Attractor Records, 455A Valencia Street, San Francisco CA 94103. (Includes shipping.) [14-2]

Musical Instruments, Sound Devices and Sonic Sculptures in Wind, String, Percussion and combinations. Art, Inventions, & Third World translations into stainless steel, bronze and/or bamboo. Waterphones, Wind Flutes, Batutus, Bamboo Wind Bells, Water Guicas, Spring Drums and more. Price sheet on request. Or visit >http://www.spacebeat.com/waterphone< Email bamboomuse@aol.com or write: Richard Waters, PO Box 1071, Pahoa, HI 96778. [14-1]

Earthshaking Music '98 Catalog is now available (FREE!). Nearly 1000 cd, book and video titles of the best in world music. New shipments of instruments from Africa, India, Bolivia. Visit us in Atlanta at our new store, or on-line at www.earthshakingmusic.com. Email erthshkn@avana.net or call 404-622-0707. [14-1]

Dr. Guy Grant has started the Oddmusic e-mail list for anyone interested in experimental, ethnic and unusual music and instruments. To subscribe to this free list go to the Onelist Main Page at http://www.onelist.com and enter the name of the list you wish to join (Oddmusic). The earlier Oddmus list on the Coollist server is gradually being phased out. [14-1]

Pat Missin would like to correspond with anyone interested in mouth-blown free-reed instruments, including both Eastern free-reed instruments and free reeds in the western tradition, such as harmonica. Pat Missin, Cambridge House, Ings Lane, Dunswell, Hull, HU6 0AL, England; email patm@globalnet.co.uk. [14-1]

Send your $20 check to: DWIN, 6971 Rooks Ct., Frederick MD, 21703. You get color pictures plus cassette of sounds of many DWINSTRUMENTS (see "Browsing" article in the Sept '98 issue of EMI). I trust YOU, you trust ME. What a concept! [14-1]

ANNOUNCING THE RELEASE OF BOOK AND CD: **Wisdom of the Impulse: On the Nature of Musical Free Improvisation**, a new book by Tom Nunn, and **Peering Over**: The Edgewater Experimental Instruments Consort, a new CD featuring 15 of Nunn's instruments with 15 players in live performance. $30 + $5 shipping for the book; $10 + $2 shipping for the CD. Payable to Tom Nunn, 3016 25th St., San Francisco, CA 94110. [13-4]

Seeking information: If you have information about bamboo saxes, or other sorts of unusual sax-like instruments, builders, history, references, anywhere in the world, please contact Ángel Sampedro del Río, Scalabrini Ortiz 1960, Villa Adelina (1607), Buenos Aires, Argentina, fax [international code, plus] 541-794-3880; email bambu@arnet.com.ar [14-1]

Reed Ghazala's **Anti-Theory Workshop** is now offering circuit-bent Incantors, Trigons, Photon Clarinets, Morphiums, Aleatrons, one-of-a-kinds, CDs and collected writings. For Reed's full-color, visually stunning brochure/catalog/fractal artwork depicting 18 instruments, CDs, friendly raccoons and more, please send $1 (or any interesting tidbit of your choice) to: Reed Ghazala c/o **The Anti-Theory Workshop**, Sound Theater, 3325 South Woodmont Ave. Cinti., OH 45213. Present web: http://www.iac.net:80/~cage/reed.html. Coming soon: http://www.anti-theory.com E-mail: qrg@anti-theory.com

Uncommonly Excellent Essential Oils -- "Ancient Wisdom with Modern Applications." The purest, highest-potency essential oils available. All organic or wildcrafted. Beneficial for health-enhancement, emotional modification, and creative energy. Single oils and blends. Hundreds of products. Some examples: *Dream Catcher*: may enhance dreams and visualization. *Gathering*: helps improve focus and achieve potential by gathering emotional and spiritual thoughts. *Into the Future*: can empower one to go forward with vision and excitement. 100% Money-Back guarantee. Free information. 227 Central St. NE, Olympia, WA 98506; (360) 753-2821. E-mail Zygadenus@aol.com. [14-1]

NEW from Experimental Musical Instruments and Ellipsis Arts: ***Orbitones, Spoon Harps and Bellowphones***, a book&CD compilation featuring the work of sixteen of today's most creative musical instrument makers. Each artist has one track on the CD, augmented by beautiful photos and informative text in the accompanying hardbound, 96-page book. This book&CD set is designed as a follow-up to *Gravikords, Whirlies & Pyrophones*, released by Ellipsis Arts just under two years ago and widely acclaimed. The format for the new release is smaller (comparable in size to a standard CD case, except that the hardbound book makes it fatter); containing fewer artists and selling at a lower price. Simultaneously, an abridged version of the original *Gravikords* set has been released in the same smaller format -- see the following ad for details. Price for either the new *Orbitones* collection or the small-format re-release of *Gravikords*: $19.95 for book and CD. No shipping charges for U.S. air mail or overseas surface rate; add 25% for overseas air; California residents only add 7.25% sales tax. Available from EMI at PO Box 784, Nicasio, CA 94946, USA; phone/fax (415) 662-2182; email EMI@windworld.com Visa & Mastercard accepted.

GRAVIKORDS, WHIRLIES AND PYROPHONES --book-and-CD set from *Experimental Musical Instruments,* produced in conjunction with Ellipsis Arts publishing company. Devoted to new and unusual musical instruments from some of the world's most interesting and inventive instrument makers. Informative text, wonderful photographs and great recordings. Every track of the CD and page of the book overflow with the ideas and the originality of the featured builders. The original, full-sized boxed set is still in print and available from us here at Experimental Musical Instruments. It features 37 musical instrument makers in the book, with music from 18 of them included in the CD. The abridged re-release, in a smaller format matching that of the newer *Orbitones* set (see previous ad), has all of the original artists on the CD plus one new one for a total of 19. But the book, in this newer release, no longer contains photos and text on the 18 additional artists not represented on the CD. Price for the original, full-sized boxed set: $29.95; for the abridged edition: $19.95. No shipping charges for U.S. air mail or overseas surface rate; add 25% for overseas air; California residents only add 7.25% sales tax. Available from EMI at PO Box 784, Nicasio, CA 94946, USA; phone/fax (415) 662-2182; e-mail EMI@windworld.com Visa & Mastercard accepted.

Musical Instrument Design: Information for Instrument Making, by Bart Hopkin, editor of *Experimental Musical Instruments*, published by See Sharp Press. *Musical Instrument Design* presents underlying principles for the design and construction of acoustic musical instruments of all sorts, with a practical, hands-on approach. No other book gathers this information under one cover. Just under 200 pages long; large format; fully illustrated. $18.95 plus $2 s&h. (This covers shipping charges for U.S. air mail or overseas surface rate; for overseas air add another 25%. Customers in California add 7.25% sales tax.). Order from *Experimental Musical Instruments*, PO Box 784, Nicasio, CA 94946, USA, phone/fax (415) 662-2182, email EMI@windworld.com.

The EMI Wall Chart is a beautiful 24"w x 36"h wall poster, with graphic design by Gwendolyn Jones, covered with practical reference information relating to musical instruments and instrument making. Suitable for the workshop or living room. Some of the material on the chart replicates material in the *Musical Instrument Design* book (see previous ad), but since the wall-chart format has its own advantages, you might be happy to have both. The price is $12. (No shipping charges for air mail within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order from *Experimental Musical Instruments*, PO Box 784, Nicasio, CA 94946, USA, phone/fax (415) 662-2182, email EMI@windworld.com.

Making Simple Musical Instruments: A Melodious Collection of Strings, Winds, Drums & More — A book by Bart Hopkin, editor of *Experimental Musical Instruments*, published by Lark Books: A collection of plans for home-buildable musical instruments, ranging in difficulty from simple to moderate. The book is written for a general, non-specialist audience, and the approach is non-technical. The instruments aren't so very far out: most of them relate to familiar instrument types and are playable as such. Yet even experienced experimenters will find some new ideas here. It's hardbound, with 144 big and very full pages, lots of color, beautiful photos & illustrations; price $24.95 plus $2 s&h. (This covers air mail within the

U.S. or overseas surface rate; for overseas air add 25%. Customers in California add 7.25% sales tax.) Order from Experimental Musical Instruments, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182; email EMI@windworld.com. Visa/MC accepted.

Air Columns and Toneholes: Principles of Wind Instrument Design is a spiral-bound booklet containing the four articles on practical wind instrument acoustics by Bart Hopkin that appeared in EMI in 1992 and 1993. The articles have been revised and improved, and there are several additional features included. Published by Tai Hei Shakuhachi; available for $14.00. (This covers air mail shipping within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax). Order from EMI, PO Box 784, Nicasio, CA 94946, USA, phone (415) 662-2182; email EMI@windworld.com. Visa/MC ok.

DISPLAY ADS IN EMI are more affordable than you might think. $60/half page, $40/quarter page, $25/eighth page. Call or write for details: EMI PO Box 784, Nicasio, CA 94946; phone/fax 415/662-2182.

SUBSCRIPTIONS TO EMI: $24/yr for U.S.; $27/yr for Canada & Mexico; $34/yr overseas. IMPORTANT NOTE: EMI will publish its last issue of the quarterly journal with the June 1999 issue. (Other facets of EMI's operations will continue in full force.) In ordering subscriptions during this last year of publication, you can choose:
1) Get a full year's subscription at the regular prices indicated above, backdated to include all four issues for the year, or
2) Get a part-year subscription at pro-rated cost, as follows: Through Jan '99, two remaining issues at $12 in US, $13.50 Canada & Mexico, $17 overseas. Through April '99, one remaining issue at $6 in US, $6.75 Canada & Mexico, $8.50 overseas.
(Even after June 1999 you'll still be able to purchase any or all of the issues you missed as back issues -- see the information in the next ad.)
Order from EMI, Box 784, Nicasio, CA 94946, USA, phone/fax (415)662-2182, email emi@windworld.com. Visa/MC accepted.

EMI BACK ISSUES: Bound volume sets Vol 1 through Vol. 12: $17 per volume. (Each volume set contains all of the issues of one volume year, photocopied and paperback-bound under one cover. The photocopies are a step down in quality from the original press runs, but they are decent as photocopies go, and they are fully readable.) Individual back issues from Volume 13 and later are available in the original press run at $6 each. These prices cover air mail shipping within the U.S. or surface rate overseas; for overseas air add 25%. Customers in California add 7.25% sales tax. Visa and MasterCard accepted. Order from EMI, PO Box 784, Nicasio, CA 94946, phone/fax (415)662-2182, email emi@windworld.com, or write for a listing of back issues and their contents. Corresponding cassette tapes are available for later volumes; see information below.

CASSETTE TAPES FROM EMI: Each cassette in the EMI cassette series contains music of instruments that appeared in the newsletter during the corresponding volume year, comprising a full measure of odd, provocative, funny and beautiful music. Volumes 6, 8, 9, 10 11 12 and 13 are available. (Vols 1 - 5 and 7 are sold out). The price is $8 per cassette. No additional shipping charge for air delivery in the U.S. or surface delivery overseas. For overseas air add 25%; in California add 7.25% sales tax. Order from EMI, Box 784, Nicasio, CA 94946; phone/fax (415)662-2182, email emi@windworld.com. Visa and Mastercard accepted.

The following is a list of selected articles relating to musical instruments which have appeared recently in other publications.

"Museum Acquires Rare Viennese Orphica: an Instrument 'for the Night, for Friendship, for Love'" by John Koster, in *America's Shrine to Music Museum Newsletter* Volume XXV #4, August 1998 (414 E. Clark, Vermillion, SD 5709-2390)

Notes on the Orphica, a lovely 18th-century portable piano-like instrument, an example of which has been acquired by the Shrine to Music Museum, with contextual information on the faux-classical style of the period and its effects on instrument design.

"A Short History of Just Intonation Tuning Culture" by Siemen Terpstra in *1/1* (535 Stevenson St., San Francisco, CA 94103)

Siemen Terpstra reviews the origins of just intonation practice with reference to the metaphysical concerns of ancient peoples and to the monochord as a mathematical tool and conceptual model.

"Musique Concréte live: Der Instrumentenerfinder und Performer Hugh Davies" by Jean Martin, in *Musiktexte* 75 (D-50464, Postfach 102461, Köln, Germany

Notes on the British performer and instrument maker Hugh Davies, who works primarily with assemblages of small, contact-miked soundmakers. (In German)

"Scientists Study Sounds of Sirens, Search for Alternatives" by Michael E. Ruane, in the *Washington Post*, September 23, 1998 (http://www.washingtonpost.com/wp-srv/WPlate/1998-09/23/110l -092398-idx.html)

A report on recent attempts to come up with different warning signal sounds as alternatives to the typical siren sounds, addressing questions of audibility in acoustically crowded modern environments, directionality and ease of spatial location, potential of hearing damage, and psychological and associative considerations.

"Theremin Jubilee Events, October-December 1996" by several authors, in *Leonardo* Vol 31 #4, 1998 (MIT Press, 5 Cambridge Center, Cambridge, MA 02142-1493)

Reports on three different events celebrating the centennial of the birth of Leon Theremin — two conferences and an art festival taking place in Moscow, St. Petersburg and Kazan.

"Multiples of Two and Five: Some Anniversaries" by Gayle Young, in Musicworks #71, Summer 1998 (179 Richmond St. West, Toronto, Ontario, Canada M5V 1V3)

Musicworks editor Gayle Young celebrates the magazine's 20th year of publication with this retrospective piece in which, among many other things, she describes her steel-tube just intonation instrument the Columbine.

American Lutherie #55, Fall (8222 South Park Ave., Tacoma, WA 98408-5226) presents the usual complement of well written and informative articles on the making of guitars and other string instruments. Wonderful pictures in this issue of resophonic guitars (ala Dobro) by Paul McGill and an unusual reinforced guitar framing system by Sam Littlepage.

"Part Manufacturing, Part Farming ... Rico's Unique Reed Business" (no author credited) in *The Music Trades*, June 1998 (80 West Street, PO Box 432, Englewood, NJ 07631)

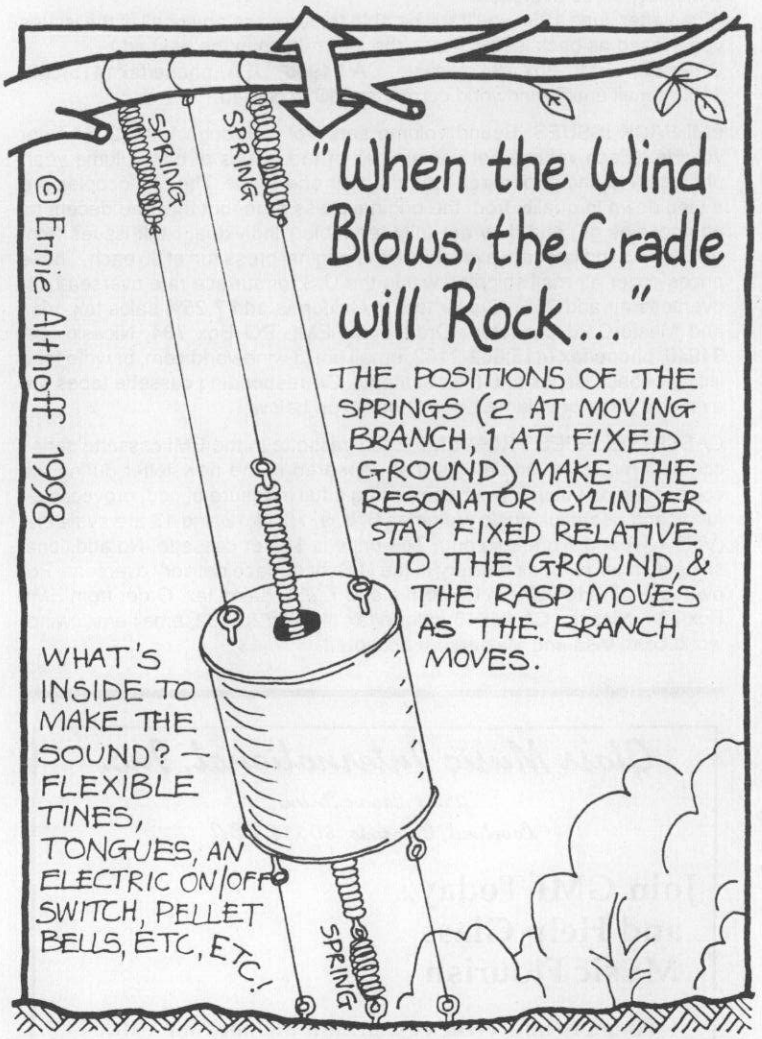
A report on woodwind reed making by the Rico company, highlighting the fact that Rico has now started managing plantations of the reed cane *Arundo donax* in California and Argentina as well as the traditional growing regions in France.

"The World's Most Musical Metal" (no author credited), in *The Music Trades*, July 1998 (address above)

A history of cymbal making with that most venerable of cymbal manufacturing concern, Zildjian, now 375 years old and still family-owned and run.

"From Antique Player Rolls to Cutting-Edge Technology: How Q.R.S. Made the Transition from Traditional Player Pianos to High-Tech Digital Reproducing Systems" (no author credited) in *The Music Trades*, September 1998 (address above)

The author describes how the Q.R.S. company, which had specialized in selling player piano rolls, responded to changing market conditions by developing a sophisticated MIDI-compatible self-playing piano and converting the company's vast library of historic player piano rolls to the new digital format.



Above: Another in a series of possible instruments by Ernie Althoff